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Games and Learning

Does your family have a game closet? Looking at the weathered and dented cardboard of stacked board-game boxes in our respective homes, we are reminded that analog games *wear* their data on their proverbial sleeves. The requisite copy of Scrabble only stays held together by a combination of staples, gravity, and unachieved dreams of triple word scores. A handful of the boxes are only recognizable from sense-memory, their spines largely covered in duct tape. Looking inside, too, offers lessons of use and preference. Nestled inside the box for Antero's copy of the two-player card game *Lost Cities*, for example, is a years-running tally of the wins and losses he and his wife have tracked for a decade and a half (Antero would prefer not to detail the rather humiliating differential when it comes to his win record here).

Data and games are a multisensory affair: we can feel and see and hear how games have been loved and innovated upon over time. But as much as we are interested in the data that individuals and companies extract from participants in games and other forms of learning, we want to start by considering the data before your own eyes when you play a game. Look at your family's favorite game . . . maybe it is a weathered set of dominoes or *Uno* deck. Maybe it's a

carefully preserved Splotter game or euro-game with all of the components carefully sleeved and maintained in pristine condition. Even the lack of wear in this sense is, in itself, a telling point about players and their desires. What might we learn if we are to feel and play alongside the games we study in this way?

This chapter explores the growing topic of games and learning. During the COVID-19 pandemic, activities marketed as or structured as games took up a staggering and unprecedented amount of student time. We explore how and why that is the case, give real-world examples, and investigate the promise (or supposed promise) of gaming in education. We also provide code for simple games that learners and teachers can build together to take control of how they express themselves and understand their own data. Games represent the imagined and actual cutting edge of learning technologies and data use. One need only look at the complex forms of learning, collaboration, and technical prowess in modern gaming to see new possibilities for design and imagination. Which is why, now, we need to take a close look at the 1980 video game, *Pac-Man*.

Pac-Man, Vision of Future Education

From a purely auditory perspective, a game of *Pac-Man* is a near-hallucinogenic experience. The sounds of pursuing ghosts and chomped pellets is an arrhythmic percussive racket of sirens, squawks, and abstract noise. It mirrors the movement of the yellow protagonist across a fixed screen. In this way, the sound could allow someone with only a passing familiarity with the more than 40-year-old game to understand the context of play. Ghosts have been turned vulnerable and are now the ones pursued; a level has been cleared; *Pac-Man* has been apprehended: all of these can be discerned without seeing the screen. It ain't much, but the sound that exists in *Pac-Man* offers

localized data and feedback about player performance and about the possibilities for advancing in the game.

There is a way of thinking about whole genres of videogames as a manifestation of the interpretation of user data. As you make sense of a game of *Pac-Man*—its sounds, its inputs, its images—something like a story emerges from the data: a yellow, very-hungry protagonist evades pursuers in search of pellets (and sometimes fruit) in a never-ending quest to consume more and to do so at increasingly faster rates. Perhaps it is a parable of capitalism or extreme hunger or the general rat race of always staying one step ahead of the demons of labor. Or maybe it's just a game about maneuvering a blip from one part of the screen to another.

Regardless of the values we might attribute to a game like *Pac-Man* and the ways we are able to interpret meaning from this character (and later the female heroine, Ms. Pac-Man), this is a game where the combination of sounds, images, and tactile engagement with controls drives meaning for players. Whether you're playing it for the first time (a little odd in our opinion) or you are steadily working to best the world records for *Pac-Man*—itself deeply contested and controversial (Kahney, 1999)—each time you play *Pac-Man* you are engaging in a process of learning, responding, and attuning to a given text. As a game, *Pac-Man* offers deep meaning for players, and that learning *can* help transform how players see the world around them. Sure, we could go deep into the hermeneutics of *Pac-Man*'s constructed world, the inherent value of cherries, and the logistics of how *Pac-Man* consumes (literally and metaphorically). Frankly, Wardrip-Fruin's (2020) appropriately titled *How Pac-Man Eats* does a good job at tackling many of these questions. All of them are learning opportunities and worthy of investigation. However, when we talk about games and learning throughout this chapter, we are less interested in how a game might be adapted and used to serve other kinds of lessons. This is precisely the kind of appropriation of youth

culture that, perhaps problematically, runs rampant in educational research. Popular games can get adapted for learning contexts in ways that build on and respect youth interests; *Minecraft*, *Assassin's Creed*, and *Portal* are all well-documented versions of this practice. However, in general, what we focus on in this chapter is how games are inherently tied to learning practices, the ways data drives learning with games, and how we might shape our understanding of research from within and through games.

What Are Games?

One common theme throughout this book is that there is a complex interaction space between choice, play, data privacy, learning, and justice. As such, when we talk about games and learning in this chapter, we are talking about how individuals and groups might consider data and options in front of them in order to take meaningful action. By their nature, games require choices; by many definitions, games are collections of contingent choices.

There are, of course, debates about both the definition of *games* and whether the term "game" even requires a definition. Like all media, games are defined by the way they are used, treated, and regarded by society. If most people consider something a game—even if it is a wombat or a dodgy Victorian lamppost—that thing is (effectively) a game. That said, as phenomenologists have so deftly articulated, sometimes it can be useful to consider a set or archetype in and of itself to figure out *why* people keep calling that lamppost a game.

As far as we can tell, people tend to feel that things are games when participants have agency to navigate some space or set of rules in a way that feels like (or explicitly subverts) progression and does not punish you outside that set of rules. In the growing body of literature specifically thinking about the contexts of games and learning, *Rules of Play* (Tekinbas & Zimmerman, 2003) is a particularly useful

primer for understanding the possibilities of play. Throughout this chapter, we build from their definition of a game as "a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome."

The subversion of expectations in games can lead to delight (for some), and the unexpected and our encounters with it are some of the key reasons we return again and again to playing games. You may have spent your childhood with a deck of cards for Spades or a family set of dominoes or even a copy of *Monopoly*. You know that these games themselves may not harbor powerful surprises. But when they are played by a group, what occurs next is never preordained. If you run into a first baseman and plow him over when you have hit a blooper, everybody (except for said first baseman) thinks this is fine (or funny). If you put on cleats and barrel people over on Mass Avenue, everyone suddenly seems very angry (unless said barreled people are wearing Yankees jerseys, in which case everyone claps). As this paragraph suggests, we take games in all forms as useful opportunities to learn from and to learn through. Sports, board games, video games, freemium games on your phone: all of these are games, and they all share similar traits when it comes to what they *do* for you as a player and, inherently, as a learner. They all also contain implicit lessons of learning in context. When and for which elements does expertise at *Pac-Man* afford skill in, say, EAFC 24 or for a pickup soccer game in the park?

What is important to recognize in these encounters with the unexpected and with the definition of gaming that we build upon in this chapter is that, while it seems like anything *can* be a game, there are delineations that are important to our purposes here. Games require constraints. We usually call these *rules*. A baseball *must* be hit with a bat (and not, say, a foam pool noodle), or else you are effectively no longer playing a game of baseball. Unless a different card is preventing it, you must untap lands and creatures at the beginning of your turn in a game of *Magic: the Gathering*, or else you are not playing a

game of *Magic*. You move your hat or dog or ship in a clockwise direction according to the roll of the dice in a game of *Monopoly* if you want to play a game of *Monopoly*. That's how these games work. You might change the rules with other players and, perhaps, go *backwards* around the *Monopoly* board or keep all creatures and lands tapped at the beginning of a turn in *Magic* or try to hit baseballs with foam pool noodles instead, but these are rules that you and other players will agree to, effectively making new rules rather than erasing old ones. This recognition that games require constraints is an important one. As we have discussed throughout this book, open-ended learning environments that encourage play offer powerful opportunities for research and engagement—and games are one form of play. However, unlike free-form play that is unbound by rules, games typically only work if we consider the texture and limitations afforded by rules. These are productive limitations that enable ingenuity for us as players.

Why Games *and* Learning

To state the obvious: *every* game we play offers an opportunity to learn. When you pick up a domino and count the pips, you are evaluating a set of choices, referencing past interactions with this gaming system, and perhaps thinking about the ways your father-in-law is probably waiting for you to fall into his trap . . . again. Going back to *Pac-Man*, described at the beginning of this chapter, each moment of play requires taking in myriad streams of information, such as Pac-Man's position on the screen, where the ghosts are located, the remaining pellets, the rate at which the game is moving (it speeds up from level to level), any fruit that may be around, and the layout of barriers and walls. It may feel familiar and internalized at this point, but this is in-the-moment synthesis and development of the deep knowledge of one gaming environment. No matter how rote a game might feel, each one requires us to act. This is an opportunity to learn. Yes, there are pedantic ways you might choose to play at random to confuse opponents or perhaps abstract examples of games that get played for

you, but these are niche cases that do not help illustrate the general role that games can play in our lives or, specific to our needs here, how we might think about the freedom that games can afford us.

While it might be useful to consider that this chapter assumes that games *are* learning, schooling systems tend to separate the kinds of learning that happen when we are playing games from the kinds of learning that typically "count" in school-based settings. This is a problem. As we explored earlier, these kinds of structures that dictate what counts as schooling are what maintain distance in our quests toward freedom. When we discussed the complex systems that track and evaluate young people in schools, what might be less clear are some of the more pernicious ways gaming has been leveraged against student learning over the past several decades. The emphasis on gamification and game-based learning in schools is a trend that is good at taking the worst (and least fun) aspects of games and mixing them with instructional content in often bland or vapid ways. It is a chocolate-covered-broccoli approach to teaching kids. This is only one way in which games and learning are mixed in the ugliest of palettes in schools. There is plenty of excellent research that covers this in significant detail, including work by Gee (2007) and Squire (2021). In addition, educational games are notorious for and noxious in their tendency to collect massive amounts of student data outside the agency of those students, all the while giving them the illusion of agency within the space of the game. There are things that exist in the liminal spaces of "almost game," "almost play," or "almost privacy," but most of the cases lie well within the spaces of accepted boundaries. We discuss a few examples in the next section.

Data and Games

Building off the framework developed in the first part of this book, we are intentionally hoping that game designers and researchers might take a step back and evaluate where, from whom, about

what, and for what purposes data is collected within educational gaming contexts. We recognize that there are myriad intersecting reasons for how such research plays out. Evaluation (and our assumptions of what ought to be evaluated) plays a central role in our understanding of how data collection unfolds around most educational activities, games included. By mapping the common trends and shortcomings of most approaches to educational gaming, we are hoping to instigate a more intentional conversation about where and how we collect data. Pushing on AnSpec here (as in previous chapters) will help us draw some key themes to build upon and some to background.

IH: Gaming as an Identifiable Human

Most single-player video games assume that you will be playing alone, that you are fine with the harvesting of your data, and that the data will be transmitted back to some centralized advertising database. According to the Entertainment Software Association (ESA, 2022), most Americans—particularly young people—have played a video game recently. Further, most Americans have phones and almost every phone has single-player games on it. The transition to "phoning home" happened reasonably quickly, and not without some controversy. Indeed, the desire that the companies had to sell or use player data outstripped the technology they used to collect it, and they started to use it for piracy prevention. Anti-piracy technologies almost invariably caused problems, locking people out of games that they had authentically purchased, and, for some time, it was common on social media to assume that someone had to have pirated a game for it to be working. The rejection of total data collection and surveillance models of single-player video games is a selling point for some distribution venues (e.g., itch.io), which explicitly advertise that their games are "DRM free" (that is, free of digital rights management). Although this is not the same thing as "surveillance free," many people treat this label as meaning just that. Not coincidentally,

over the past 10 years, many single-player phone games have gone "free to play," which means that you can play free for a bit before you must explicitly pay for "gems" (or other in-app purchases). This process profits from players via multiple streams, both harvesting their data and making money from continually charging those players for the ability to keep playing games. If this sounds like the logic of slot machines, that's because these games seem to be modeled after gambling systems. The popular gaming site Polygon (Kuchera, 2018) has suggested that single player mobile games are almost dead but for "free to play" models. However, services such as Apple Arcade, which includes many games—explicitly excluding free-to-play games and predatory mechanics—in exchange for an overall monthly fee, are opening new models of gaming and consumption. Presumably, like other Apple digital products, this approach does not purely abandon surveillance, but rather limits it to within Apple with some promises not to sell that data.

AG: Gaming as an Anonymous Group Activity

Like IH data, anonymous grouped data is reasonably common in games. Many games, especially games played in public spaces like arcades or museums, do not propose to gather data on any individual; indeed, they could not even do so if they wanted to. It would be difficult, for instance, to differentiate player movements at a mall arcade version of *Street Fighter 6*. Obviously, these games are far less common than they were when we were children, but they persist, and the remnants of arcade culture continue to shape gaming communities and society at large. Arcades (e.g., Dave and Buster's), movie theaters, and many other public spaces use digital games to draw people in or entertain them while they are waiting, lounging, or socializing. Pinball, for example, has waxed and waned multiple times in the past few decades. These types of games collect data, though the data that they collect might be restricted to things such as crashes, play time or, most likely, the amount of money the game takes in. These events

happen in aggregate, and they might be used, mostly locally, for decisions about which games might be fixed, bought, or moved off the floor. Still, the very act of engaging with a game in a public space is an aggregate grouped act. Their persistence is notable. There is something enjoyable about competing against others in a physical public space (think of the leaderboard of a pinball machine) that is hard to replicate at the global or national or international scale that online games might inhabit. That may explain one element of why they have not entirely vanished the same way as older technologies like telephone booths, despite both objects being supplanted by cell phones.

Less commonly seen by most of the public, augmented reality games (ARGs) offer a terrific example of anonymous grouped games. Born initially from online internet activity (and tied to film marketing), ARGs can be entirely analog (Garcia & Niemeyer, 2017). The simplest example might be geocaching, in which you find or leave hints for people as to where to find interesting tidbits, which the finder replaces with new items for the next player. The assumption is that the anonymous crowd of fellow geocachers fills out the space of possibilities; that is what makes the game interesting. Finding a cache feels simultaneously personal and anonymous. Today, geocaching can be tied to apps and GPS technologies, but at its most basic, these are not necessary to play and attune your behavior as a player to the world around you and the guidance of other, anonymous players. You might find an interesting book and leave another, or you might find a note from someone who's been there before and leave another with your name.

AH: Anonymous Individuals, Games, Gambling, and Education

In sharp contrast to the bombast and collective participation of arcade games that require the presence of other players, single-player video games have almost completely vanished from these spaces. When it comes to gaming in public, gaming has embraced the social. It is hard to think of a place where it would be expected for you to

be playing in public in a way that doesn't interact with anyone else, at least in most Western contexts. This is likely because most Americans have phones or computers on which they can play games; if you want to play alone, you now do it alone. In this way, the number of people idly playing videogames by themselves in public has exponentially risen, but they do so hidden from the gaze of others, perhaps while waiting for public transportation or for friends to arrive. This is done casually, privately, and outside of the quarter-consuming contexts of spaces designed for gaming.

Most people who want to play a video game alone do not tend to go anywhere to do so. That said, perhaps at the outer boundaries of what counts as a game, you find the slot machine. The slot machine is specifically a game in which no one cares to harvest your data because they are making money not from your data, but from you. If there's any notion that you might be less likely to put money in the machine should it collect your data, they will avoid doing so. The experience is also aggressively individual. If there are multiplayer slot machines—which there might be, though we can find little evidence of any—they are rare. Instead, the deal that these machines offer you is that they will not ask anything of you if you pay them money directly. The games themselves are not fun, and there are few (if any) choices. However, there is the thrill of winning, rare as it may be; the choice that you make when you play a slot machine is a decision: "How much am I willing to lose in order to enjoy the potential to win?" At the moment, slot machines are effectively anonymous, despite being electronic and networked.

If gambling occupies a space at the periphery of gaming, team sports have historically represented the set of games of which video games were the periphery. Team sports exist in almost every part of the United States; they are a core activity for many Americans, whether watching, participating, or simply reading about them. As a nation, the US loves teams categorically. When players across professional sports occasionally blurt out an "I'm in it for myself"

statement, they are branded a heel or a villain. It is understood that if you play on a team, you play *for* the team. In the time you've taken to read this chapter, there have likely been interviews in which a star player, who may have been largely responsible for a win, states or suggests that it is "all about the team." This perspective carries from Little League to the NFL. Metrics of and data about *teams* are repeated endlessly. A team's seasonal performance and golden ages of a team are shared by fans. It is an issue for more focused studies than ours as to why it persists, but the team as an identified unit has a set of data associated with it and fans show loyalty to those data—even if no players, owners, resources, buildings, or managers are shared over the course of decades.

Speculative Play, Data, and Justice

Considering the wide array of kinds of play that afford different kinds of data, it is frustrating that educational gaming data are so bad. Our collective emphasis on assessment and myopic visions of knowledge have crowded out varieties of games and the ensuing fun they could provide. As two educational researchers who spend a lot of time thinking about, studying, and creating games for learning, perhaps our cynicism at the state of this area may seem surprising. However, this cynicism is born of seeing far too many predatory approaches to engaging students and teachers.

Video games, as we have seen, tend to be more of a signifier of what is called "social configurations" or "frames" (Goffman, 1974) than they are a specific formal representation. A game is less a specific set of criteria and more a way of interacting with people. If you kick something at someone while smiling, you are playing a game; if you draw on a chess board, you are not. The things that become games tend to revolve, in some ways, around how your choices are

encoded into input data, whether the game is a tabletop board game, a sport, or a video game.

To start, positioning your choices as "mutually enjoyable" can make a lot of things into a game, if that proposal is accepted by other people. It can then become collaborative, competitive, or cooperative—you might be working together or against each other—but, in any case, it must be understood either as the specific instance of something well accepted to be a game (e.g., boxing might not look very fun) or something mutually enjoyable (e.g., kicking something to someone can be threatening or playful depending on context).

What is notable is that the one thing that turns many things into games—whether or not they share any formal similarities with "things believed to be games"—is mutual data. When multiple beings exist in the mutual space, then scoring things or even just keeping mutually agreed data records (such as a log) makes many things into games. Try it: Do something mutually acceptable to someone near you—maybe say "What do you want for lunch?"—and then when they respond, follow it up with (for beginners): "It's not 21 to 16; you're winning" or (for experts) "That's two reds and a blue for you, but I've got seven green—I am catching up." This is now a game; this is the magic of data. Indeed, Boluk and LeMieux (2017) play on this more eloquently, giving you a *score* as a reader, thereby gaming game-based learning.

Toward Just Futures: Subversive Play for Liberation

A few questions that emerge from considering the possibilities of play are these: Who gets to create the mutual data? Who gets to control the mutual data? How manifest and substantive are the choices that a "player" can make? A truism we are reminded of when it comes to games and data is that "the house always wins." In the literal sense, casinos may pay out occasionally, but they structure the rules and contexts of the games such that they always end up making money

in the long term. More generally, it suggests that when you make the rules—especially in scenarios in which the context both affords you power (e.g., casinos and capitalism) and gives you the power to both enact and enforce the rules you've made (e.g., security guards and ideology)—you will win. You do not necessarily need the full weight of the state to enforce the rules of a board game, but gaming requires that the people playing afford you opportunities for the power of setting the rules.

When that power interacts with the other factors of games mentioned earlier—addictiveness, fun, collaboration, learning opportunities, and local choices—the water grows murkier. That said, these factors—perhaps even "fun" and "addictiveness"—all reflect what many people consider a best-case scenario for schools. This suggests the open question with which many people in game-based learning research still struggle: When is it ethical to use games instrumentally in schools? Is it ethical to get kids "addicted" to math games or "tricked" into enjoying problematic or rote content if the result is that they become very quick with basic arithmetic or reading? If we believe that books can convince someone of something, we have to believe that games as a medium must be able to do so as well. This must be at least trivially true, because books can be "phrased" as a game, and it would be a hard argument to make that they lose all their rhetorical power in that scenario. Bogost (2008, 2010) makes the opposite point: in fact, games *gain* further rhetorical power through choices.

What are the ethics of the real and current scenario in which students are "convinced" to share sensitive data to play educational games? As there is very little oversight of game data logging by private companies (outside of federal guidelines, where it is hard to prove a violation without direct evidence), we have essentially decided to trust major educational technology companies to use our children's data responsibly. Some of these "games" are only framed or marketed as such; they might signify choice but, in the end, afford basically

none of it. Students are now, by and large, are savvy enough to know the difference, and the conflict between diegetic signals of choice and actual meaningful choices stands out to pretty much everyone involved. (Your days are numbered, "game-like" videos on rails.)

Games are much more common now in schools than they were a few decades ago; the independence of being able to choose one's content and work with friends to tackle it was, basically, unthinkable in the massive public-school framework then. In this spirit, there is something transgressive to be found in introducing designed experiences that prioritize both student choices and student collaboration and cooperation over regressive models of school. Now it is common enough that teachers, parents, and students feel free to complain when it is absent. Unsurprisingly, it turns out that providing students with opportunities to make meaningful choices about how they spend their time is, on the whole, a good thing.

The Left Hand of Data

Designing Education Data for Justice

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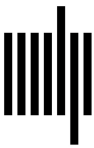

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