Praxis Games
A Design Philosophy for Mobilizing Knowledge through Play

Steve Wilcox

Game design offers a unique but often misunderstood pedagogical opportunity. The author draws on learning theory, feminist epistemology, and game studies to analyze a novel genre of games capable of realizing this opportunity by mobilizing knowledge through play—praxis games—founded on the concept of situated praxis. Situated praxis encourages the design and development of games that guide players to discover knowledge inside a range of communities, domains, and experiences. To demonstrate the applicability of such design, the author discusses his experience with games related to healthcare. **Key words**: feminism, game design, health care education, knowledge mobilization, learning and videogames, praxis

Introduction

The question of how learners acquire new knowledge and skills has inspired educators and designers for millennia. Among the varied approaches to teaching, some elements persist across methodologies and pedagogies. These include context (i.e., we find it easier to learn knowledge specific to a situation), practice (i.e., we incorporate new knowledge better when we apply what we learn), and experience (i.e., we retain knowledge better when we discover it ourselves). As it happens, games include all three of these characteristics of learning. They create unique contexts or situations through their rules; they encourage players not only to practice but to create practices (i.e. strategies, tactics, and schemas); and they communicate through the experience of playing. Thus games make unique pedagogical tools because they incorporate the fundamental qualities of learning into their very form and structure. Perhaps this explains why James Paul Gee (2008) calls game design "applied learning theory."

American Journal of Play Volume 11 Number 2
Contact Steve Wilcox at swilcox@wlu.ca

Despite these affordances, educational games have largely fallen short of their pedagogical potential. As Henry Jenkins and Randy Hinrichs (2008) note in *Games to Teach,* "Most educational games have failed because they use generic game templates (e.g. *Pac Man*) rather than original game rules designed to illustrate the rules of a system." In these instances, designers blend existing entertainment game designs with educational content, a combination that has yielded mixed results compared to more traditional pedagogies. Concerning health care, for instance, educators have included medical content in games like *Family Feud* (Burke 2001) and Snakes and Ladders (Telner 2010) to train health professionals, but they have found the results disappointing. Some might see these studies as evidence games are ineffective pedagogical tools (Akl et al. 2013), but it is important to recognize such approaches largely disregard the educational affordances of the medium, including those mentioned above in which games uniquely combine context, practice, and experience. In fact, it would be beneficial to articulate a design philosophy for developing educational games rooted in such fundamental qualities of effective learning.

In this article, I outline one such approach to creating educational games, what I call *praxis games*. Praxis here refers to the process by which something abstract—such as a theory, a body of knowledge, or a skill—is made concrete through a process of enaction. Games uniquely foster praxis because they are a participatory and practice-based medium. In defining a genre called praxis games, I encourage the design and development of games created specifically for players to enact, embody, or realize a theory, lesson, or skill using the qualities of context, practice, and experience.

I begin by defining and explicating the genre of praxis games, supplying key terms and concepts from the areas of game design, media theory, feminist epistemology, and game-based learning. I then relate this novel genre to a particular field of practice—health education, both professional and public. Health education was selected because educators working in this field are particularly inclined to include unrelated knowledge in existing entertainment games, leading to mixed results and a perceived deficiency when it comes to games and their capacity to function as effective educational tools. But more broadly, the term praxis games applies across a range of professions and situations with implications for education, journalism, intercultural communications, social justice advocacy, empathy building, and other subjects. In fact, the philosophy I present is simply a way to view games themselves as effective tools for mobilizing knowledges and practices. To foster the creation and development of this

genre, I articulate five design heuristics for creating praxis games, drawing on the evidence of many projects, including my own experience as a designer of health games. These heuristics are not novel in and of themselves, but their assemblage under the category of situated praxis is. I merge feminist theory with situated learning theory, allowing disparate design principles to be unified under the premises that learning is embodied and that knowledges and practices are situated across individuals, communities, and cultures.

Praxis Games

Praxis refers to "the process by which a theory, lesson, or skill is enacted, embodied, or realized" (Wikipedia "Praxis" 2017). Conceptually, praxis brings together the three elements of learning I have mentioned. First, it occurs within a practical situation or context. For instance, when individuals learning cardiopulmonary resuscitation (CPR) are presented with a (simulated) medical emergency, they encounter a situation in which they must apply abstract knowledge to a concrete subject, prosthetic or otherwise. Second, praxis involves practice, a process that often yields new insights not readily apparent in the abstract articulation of a theory, lesson, or skill. For example, most individuals generally know that CPR involves a series of chest compressions and breaths. But in a simulated or actual emergency, many are surprised to learn that, in properly administered CPR, broken or fractured ribs commonly occur. Practicing the application of proper pressure using a prosthetic chest helps trainees learn to conduct CPR effectively, which, contrary to its romantic portrayal on television and in film, can be a difficult and somewhat unnerving process. Lastly, praxis fundamentally involves experience and the discovery of new knowledge and skills through individual senses, choices, and actions. For instance, the standard prosthetic doll used in CPR training is of a singular shape, size, and gender. However, experienced practitioners know that the abstract procedures of CPR are concretely affected by body types and gender dictating how it should be applied—that is, larger individuals often require the use of more pressure to compress their chests than do slimmer individuals.

With this in mind, the notion of praxis games begins to take shape. Nominally, they are games designed for players to enact, embody, or realize a theory, lesson, or skill. From a genre perspective, they are a kind of "epistemic game" (Shaffer 2006)—games concerned with the acquisition of new knowledge and skills. From a design philosophy perspective, my concept of praxis games builds on the work of Dennis Ramirez and Kurt Squire (2015), which blends game

design with situated-learning theory. Praxis games are distinct from other subgenres because they encourage designers to view game play itself as a form of situated praxis.

To speak of praxis as situated is to note that the means by which knowledges are constructed vary by bodies, communities, and cultures (Haraway 1988; Harding 1993; Lave and Wenger 1991; Collins 1991). For instance, the medical community commonly understands depression primarily as a chemical imbalance. In this context, addressing depression aims at restoring this balance, typically through pharmaceuticals. In contrast, a therapist might view depression in the context of lived experience and psychological distress and trauma and believe it is best treated by reviewing such experiences and alleviating such distress in the process. In both instances, the context shapes knowledge of the subject and yields distinct practices. In feminist epistemology, this is called "situated knowledges" (Haraway 1988). Situated praxis, another feminist term (Collins 1991), refers to the process by which knowledge of a social, cultural, or professional situation gets realized or enacted.

Games, as it turns out, are ideal tools for conveying situated knowledges because they can engage players in instances of situated praxis. They achieve this feat by creating situations or contexts in which various ludic, social, cultural, and professional practices arise. As Mary Flanagan (2009) observes, "Games can be thought of . . . as situations with guidelines and procedures" (7). Consider the game *Depression Quest*, including how and where it situates the player. My discussion of depression above involved interrelated professional paradigms, but *Depression Quest* looks at how nonprofessionals understand the condition. Specifically, the game attempts to rectify the erroneous context in which nondepressed individuals tend to situate those with depression. In this flawed context, many conceive of depression as something an individual can overcome through hard work and determination. As a result, they often encourage those with depression to adopt a number of specious practices, such as developing a positive attitude, dismissing or suppressing negative thoughts, and reading self-help books and blog posts. *Depression Quest* presents these oversimplified choices to players but prevents them from being selected because the game situates the player in the context not of the neoliberal's imagination but in the practical circumstances depressed individuals face. In this context, such facile options are not only unavailable, they are properly seen for what they are: condescending and demeaning suggestions that have no practical role to play in the lives of those who experience depression. Players come to this realization

experientially, through practice and in the practical context of the day-to-day life of someone with depression. Game play here can thus be seen as a form of situated praxis as players enact, embody, or otherwise realize theories, lessons, and skills endemic to the experience of depression.

The term praxis games formally identifies this situated approach to game design. As a philosophy, it encourages designers to view game play as a form of situated praxis, a process of bringing forth knowledge and practices endemic to particular situations. The craft of game design, approached from this perspective, involves the artful and purposeful construction of these situations to guide the learner toward the discovery of situated knowledges.

Terminology, Theories, and Concepts

Edutainment and Professional Training Games

I should note that, although praxis games offer a relatively novel approach to designing educational games, they exist in a larger history of games seeking to blend play with the acquisition of knowledge and skills. Professional-training games, such as team-building exercises and online training modules, have long existed and have become a mainstay for instructing new employees. Similarly, educators now often look to edutainment (or educational games) to foster audience engagement and make learning less arduous. However, both of these genres have earned a reputation for producing reductive, shallow, and overly punitive games. Although professional training games have received less scholarly attention (for business, see Bazil 2012; for health care, Wang et al. 2013; Akl et al. 2013), considerable scholarship on edutainment disparages edugames (Van Eck 2006; Charsky 2010; Jenkins and Hinrichs 2003; Alaswad and Nadolny 2015; Dicheva et al. 2015).

When it comes to professional training games and edutainment, scholars direct their criticism less at the medium of games itself and more at the approach game designers have adopted. The most common critique asserts that designers overlook Marshall McLuhan's (1994) statement that "the medium is the message." As Jenkins and Hinrichs (2003) noted, educational games tend to mimic existing entertainment models instead of pursuing their own custom rules and mechanics. This practice of "reskinning" a game to include educational content—such as replacing the generic facts of *Trivial Pursuit* with domain-specific knowledge—remains prevalent, doing a disservice to the medium and its capacity to

situate players in unique learning environments. Most edutainment critics note that the real pedagogical potential for games lies in their capacity to represent uniquely gameful situations, such as complex systems, dynamic interactions, and branching narratives (Bogost 2007; Zimmerman 2013; Murray 1997). To explore this potential, game designers will need to develop novel rules and mechanics specific to the subject matter they seek to convey. As Chris Swain (2010) puts it, when it comes to game design, "the mechanic is the message."

Game mechanics refers to the actions and operations prescribed by the rules of the game (Galloway 2006). Game mechanics are the principal practices in which a player engages when situated within a game space. In cribbage, for instance, the rules of the game reward players who can count off the most card combinations adding up to fifteen at the end of each round. Effectively, this rule prescribes a set of practices (e.g., using the odds of playing card distribution strategically to retain those that add up to fifteen) that then become the core mechanic of the game. Traditionally, professional-training and edutainment designers view popular game mechanics as a means of generating interest, excitement, and fun. From this perspective, educational game design involves selecting an existing game (e.g., *Jeopardy* or *Snakes and Ladders*) and then attaching domain-specific knowledge to their mechanics, a move that assumes form and content to be distinct.

As a child, I recall playing an edutainment version of *Asteroids*—a classic arcade game in which a spaceship must shoot approaching asteroids or be destroyed. In the version I played, I "fired" numerical answers to "destroy" approaching math equations. In this case, the mechanic of the game conveyed one message—the player is an imperiled pilot of a spaceship, while the designers tried to convey another—the player is a learner of basic arithmetic. Some educators refer to this design methodology derisively as "chocolate-covered broccoli"—an attempt to entice learners by applying a thin layer of something appealing to an otherwise distasteful learning experience.

Looking beyond Edutainment

As game design receives more critical, artistic, and scholarly attention, games clearly develop far more potential than mere mechanisms for delivering unrelated content. Components of game design such as mechanics, narrative, choice, player-driven exploration, and trial-and-error are not simply means to an educator's end but rather rhey are the very mechanisms by which learning takes place.

For instance, the math version of *Asteroids* I played could be redesigned to

offer a more cohesive and compelling experience in which the medium conveys the message. In this revised version, players would take on the role of a software engineer on a spaceship whose targeting system is malfunctioning. The player's job is to debug the code, which happens to involve fixing some mathematical errors. As the player debugs the code, the targeting system grows more accurate, allowing the crew to better protect the ship. Here the narrative situates the player using a "roles and goals" approach (Edelson 2002; Norton 2005). That is to say, the player is given a real-world role (a software engineer), and the setting provides a goal (the code needs to be debugged to save the ship). This gameful situation creates a context for the player in which learning and play mutually reinforce one another, contrasting the edutainment model in which play is interpreted as fun and learning as largely unrelated labor. In fact, this was the approach taken by the developers of *science.net*. In this game, players assume the role of reporters working for an online, science-based magazine. As David Shaffer (2006) details, this epistemic game teaches grade schoolers the common professional practices of journalists, ranging from storytelling to copy editing, by situating them as actors or agents within the profession itself.

The shift away from games as simple content delivery mechanisms toward treating games themselves as unique communicative media is often characterized as a move from edutainment to serious and purposeful games. The development of serious games is relatively recent, though there are certainly exceptions (see The Landlord's Game introduced in 1906 for instance). From a research perspective, this novelty poses an interesting challenge because serious game designers recognize but are not yet proficient at using the communicative affordances of the medium. Meanwhile, skeptics understandably look for evidence of the greater effectiveness of serious games compared to their predecessors. In this regard, games and health care offer especially paradigmatic representations of the pitfalls and promises of games that can teach and train.

One key distinction between edutainment and serious and purposeful games involves the role of fun. Under the edutainment paradigm, educational games leverage fun—meaning, in this case, exciting and often frivolous game play—as a means of enticing players to engage in more arduous or demanding learning exercises. As both the literacy of game designers and game players has continued to mature, the need for games to be fun has somewhat diminished. The concept of fun might be more productively replaced by the notion of engaging or compelling game play. In the autobiographical game *That Dragon, Cancer*, developers Ryan and Amy Green show players how they came to terms with the

tragic news that their infant son has a terminal form of cancer. *That Dragon, Cancer* tells a moving and engaging story that teaches players about fundamental aspects of being human—of love and loss, joy and sorrow. The game is powerful and deeply moving, but it hardly offers an experience one would call fun. Other games that teach players about health (*Depression Quest*, *Actual Sunlight*), politics (*Papers, Please* and *Syrian Journey*), socioeconomics (*Cart Life*, *The Uber Game*), and the lived experiences of marginalized persons (*Mainichi*, *Dys4ria, Stasis*) eschew the edutainment paradigm in which fun is the primary motivator of engagement. Instead, such games—many of them discussed briefly in the conclusion—appeal to the player's rational curiosity about the world, what William James calls the sentiment of rationality (2014). Games appeal to this sentiment by creating compelling, intriguing, and challenging situations for the player. This is not to say that fun or frivolity have no place within serious and purposeful games—*That Dragon, Cancer* contains moments of levity and unbridled play that show us, as players, the joyous relationship these parents had with their infant son. Nevertheless, learning through games does not need to operate under the aegis of fun to entice and engage players; one need simply design situations in which the rules and practices appeal to the player's rationality.

Games, Learning, and Health Care

Using Games to Teach Professionals and Patients

Health care presents a unique environment for exploring game-based learning, in part because medical professionals at regular intervals must undergo both training (e.g., medical education) and retraining (e.g., emergent evidence and research). Of course, nonmedical professionals may engage with the latest findings on health and well-being as well. In any case, serious games can play a positive role in these engagements when they are rooted in both the best health care practices for individuals and in the robust evidence that informs these practices.

Surveying the health care games field, one will find both the legacy of edutainment and a turn toward more nuanced and novel designs. In health care, commercial games have long been recognized for their capacity to provide therapy (Redd et al. 1987; Vasterling et al. 1993; Patel et al. 2006) and train the dexterity of surgeons (Larsen et al. 2009; Rosser et al. 2007). However, when it comes to games designed specifically for training medical professionals, edutainment remains the typical approach. For instance, Akl et al. (2013) evaluated two

edutainment products in assessing the merits of games for training medical professionals—one was a game based on the television program *Family Feud,* and the other was an edugame based on the traditional board game, Snake and Ladders. Their conclusions, which cast doubt on the prospect of using games for training health professionals, are hardly surprising given the literature on edutainment.

In fact, when curricula creators pair educational content with unrelated game mechanics, the resulting experiences often lack meaningful play (Tekinbaş and Zimmerman 2004) because the repurposed game mechanics do little to support the specialized content. Here, the term "meaningful play" denotes the meaning that emerges between action and outcome in a game. Tekinbaş and Zimmerman note that play becomes meaningful when the relationship between action and outcome is both discernable and integrated. In the case of edutainment, designers have often struggled to integrate the relationship of action to outcome into the larger context of the game. The *Asteroids* game, for instance, in which players fire numerical answers at descending equations, failed to integrate the action-outcome relationship within the space-faring context of the game's setting, depriving the player's actions of meaning. The proposed revision of that game—in which players debug the targeting software of a ship's defences by solving mathematical errors in the code—seeks to make the action-outcome relationship more cohesive and meaningful by integrating the game's learning component into its ludic and narrative context, thereby providing a practical (albeit fictitious) purpose for engaging in the activity.

The lack of meaningful play helps explain why researchers have had a mixed response to health care–related games. For example, Rui Wang et al. (2016), in their review of the role of serious game play in medical education, conclude that the field shows promise but lacks a cohesive method for developing and evaluating effective games. In Pamela Kato's (2010) comprehensive review of games for health, she argues that, "The time has come for treatment plans to explore the use of video games as adjuncts to therapy to help patients take full advantage of advances in treatments. Medical curricula designers also should consider including video games as teaching tools so that our wealth of health care resources can be delivered safely and effectively" (120).

Still, there are medical games that do take up these recommendations and eschew the edutainment model. Games such as *Burn Center* and *Pulse!!* represent simulation-based approaches to training both civilian and military medical professionals. Meanwhile, games such as *Oncology Game* have been used

to help medical students navigate the multidisciplinary nature of cancer care. Indeed, researchers found that those who played the *Oncology Game* were able to answer more questions correctly compared to their nongame-playing peers (Fukuchi et al. 2000).

More recently, designers of health care games have begun focusing on specific situations and scenarios that have proven challenging for practitioners. In *SurgeWorld* players learn the disaster preparedness procedures for California hospitals by managing a triage overrun with patients. The game teaches players the best practices for responding to crises, including the ethical challenges posed by allocating medical personnel and resources to more critical patients compared to less critical but still imperiled individuals (Swain 2010). Similarly, players of *Night Shift* learn the best practices for properly assessing and treating critical injuries, including tackling the issue of diagnostic errors in emergency care (Mohan et al. 2016). These games show more promise compared to their edutainment predecessors because players encounter situations designed to teach them to assess their circumstances and pursue the appropriate practices instead of encountering arbitrary situations (e.g., landing on a particular square in a board game) that call for recollecting previously learned knowledge (e.g., a piece of medical trivia).

As Wang et al. (2016) and Kato (2010) suggest, games should be considered a means of mobilizing knowledges and resources. However, lest we fall prey to the same pitfalls that undermine edutainment, we should not think of games as content delivery mechanisms. Furthermore, we should not conceive of knowledge simply as material to be distributed. The communication of knowledge requires considerable effort, often paired with experience and practice. Games, understood as designed experiences, can play a prominent role in this process by transforming the cognitive labor involved in knowledge acquisition into an act of situated praxis. With these broad concepts in mind, I specify the heuristics for designing such praxis games.

Five Design Heuristics for Creating Praxis Games

Design heuristics constitutes the designer's means of sharing practical theories and practices with other creators, researchers, and players. Dennis Ramirez and Kurt Squire (2015), for instance, offer ten heuristics based in situated learning theory for designing learning games: to motivate persistence, promote mastery,

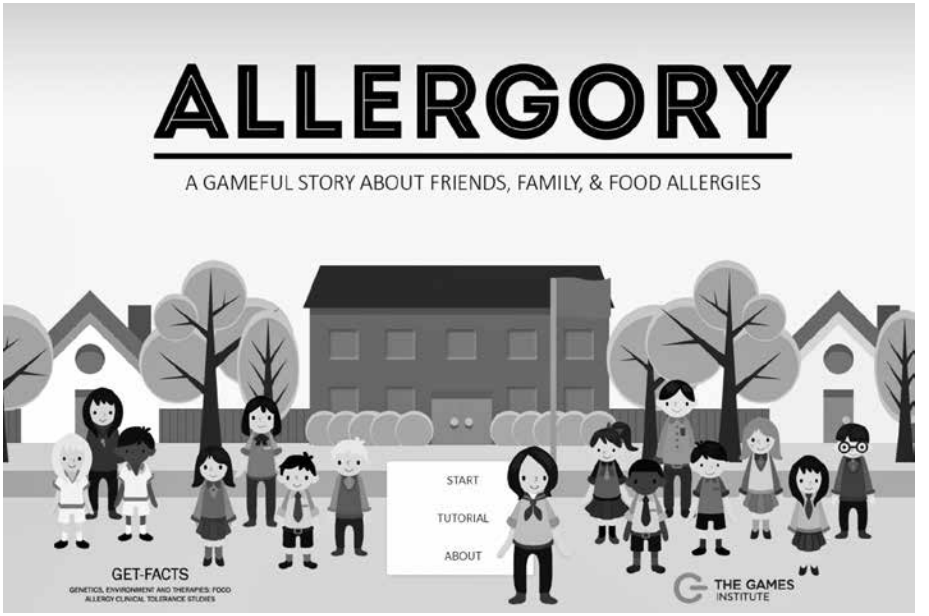

Figure 1. The title screen for *Allergory*. The game can be played at https://praxisgames.itch.io/allergory.

encourage exploration of new systems, and reframe game play experience to promote reflection, among others. Similarly, Swain (2010) describes six best practices for designing mechanics that convey learning objectives. These include integrating subject matter experts throughout the development process, defining and prioritizing learning objectives, and embracing learning science. Praxis games can be seen as a subgenre of learning games and so they inherit a number of these heuristics and practices. However, praxis games have a specific goal—to have players enact, embody, or realize a theory, lesson, or skill—and, as such, they need specific design heuristics.

The following five heuristics highlight the affordances games have for fostering the discovery of situated knowledges and practices. These heuristics appear implicitly in a number of existing games. I also used them explicitly to create *Allergory*, a knowledge mobilization game I developed as part of my doctoral thesis. Throughout this discussion of heuristics, I will use *Allergory*, among other games, to illustrate my recommendations.

Design Heuristic 1: Gameful Situations

Humans are situated creatures. Our cognition is situated through our bod-

ies (Brown, Collins, and Diguid 1989), our knowledges are situated through our positions and practices (Haraway 1988; Harding 1991), and our minds are situated in and through cultural contexts (Cole 1996). Acquiring new knowledges and practices, then, requires a kind of speculative transposition—a way of thinking through numerous and varied perspectives so that we may find the knowledges and practices within them. For this reason, it becomes useful to create gameful situations—rule-bound spaces in which game play is an on-going process of situating oneself and one's knowledge and skills within a novel social, cultural, or professional context.

Most, if not all, games create gameful situations. Players of the Super Mario series, for instance, have experienced a novel rule-bound space before. Their knowledge of the game is situated through Mario's carefully crafted ability to interact with the game world. In short order, players find themselves thinking through the distances Mario can jump, the speeds at which he can run, the heights to which he can reach, and the walls he can scale. In these moments, players not only grasp the unique logic of the game world, but they apply it repeatedly as they solve the various problems and obstacles the game puts before them. Another way to describe this process is to say that players are situating themselves in Mario's world and their experience playing the game brings forth knowledge and practices endemic to that world. For example, in some Super Mario games, gaps exist between platforms that Mario simply cannot jump between. And yet in these instances, the linear design of the levels implies there must be a way across. In this situation, players soon discover the practice of running and jumping, the momentum of which sufficiently spans the gaps between distant platforms. Once players make such a discovery, they will begin to recognize similar situations where the practice of running and jumping is required and intuitively employ the practice. In this way, Super Mario games can be seen to convey knowledge and practices situated within the game world.

In contrast to commercial entertainment games, praxis games are designed with the explicit purpose of mobilizing extraludic knowledge, knowledge endemic to the world outside the game. This was the goal of *Allergory*, a game that seeks to teach non–food-allergic persons about life with a food allergy. In food allergy research conducted by Nancy Fenton et al. (2011), the researchers found elevated levels of stress and anxiety among food-allergic children. Such negative experiences correlated with situations unique to the food-allergic child's experience. These situations (which included school lunches, group meals, family dinners, and holiday gatherings) are unique not in the abstract sense (because

many people, food allergic or not, would find these occasions familiar), but rather they are uniquely experienced by those with food allergies. *Allergory* recreates seven of these situations, using interviews with food-allergic children (provided by Fenton and her colleagues) to create the rules of the game, ensuring a degree of sociocultural verisimilitude that constrains player interactions to those discursive and sociocultural practices that arise in the food-allergic child's experience (see figure 2). These practices include carefully reading food labels, defusing social situations that involve allergens, and training peers and guardians in the nuances of food safety. More generally, gameful situations offer opportunities for the designer to create contexts for learning in which the player discovers or invents new knowledge throughout the course of play, a feat achieved by purposefully constraining the discursive and ludic practices at the player's disposal.

Design Heuristic 2: Situated Praxis

As I have noted, praxis refers to the process by which a theory, lesson, or skill

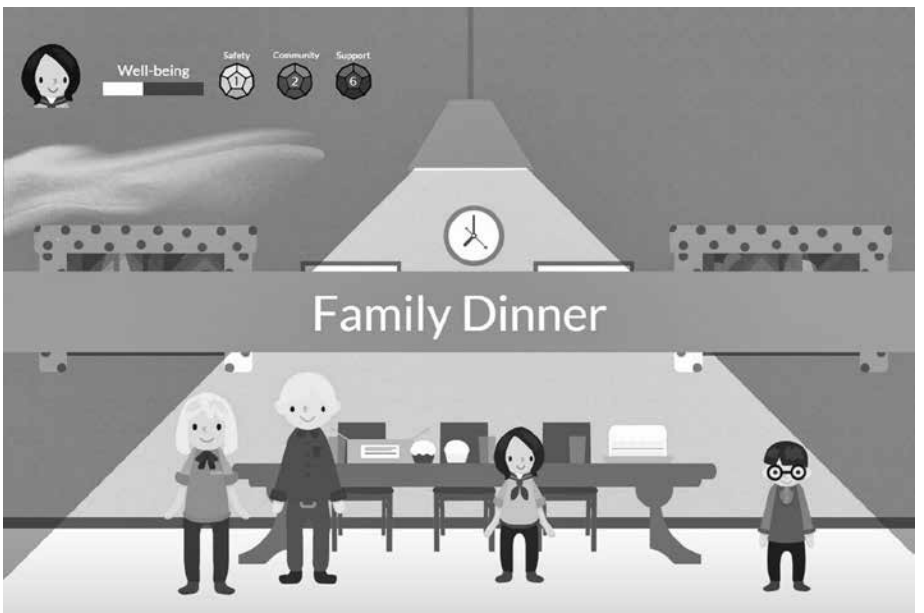

Figure 2. *Allergory* depicts social situations that were commonly cited among food-allergic children as particularly challenging circumstances. In this level, players must navigate the intergenerational knowledge gap that has emerged alongside the increased prevalence of food allergies.

is enacted, embodied, or realized. Situated praxis recognizes that different situations—physical, social, cultural, or professional—call for distinct forms of praxis. For instance, many role-playing games involve teams comprised of interdependent character classes. Those in the tank class dole out and receive damage, for example, while those in the healer class ensure that the tanks stay alive. These unique roles, and the skills associated with them, lead to equally unique situations in the game fostering the discovery of distinct practices. Commonly, those in the tank class, for instance, remain at the front of a party when entering a battle because they are best equipped to weather enemy blows. Conversely, those in the healer class commonly stay at the back of a party to avoid the fracas as they heal fellow party members from a safe distance. Players can be made aware of these common practices, but more often than not they learn them best by encountering particular situations and discovering through experience the practices endemic to these circumstances.

This same principle holds true in social, cultural, and professional settings. For instance, although a nurse and a physician may be physically located in the same space, their professional situation within that space entails the use of distinct practices. A training game that allows players to discover the practices endemic to these roles would not only provide an opportunity for situated praxis—that is, to discover the practices endemic to these situations—but it could also foster understanding between professional situations as players come to understand the practices used by their colleagues and how they combine to shape the well-being of the patient or client. Similarly, gamers who have played different classes and roles have a deeper understanding of the behavior of their party members—their distinct, role-based practices make sense because these players recognize the unique position that that role or class occupies in any given situation even if they rarely play in that particular role or class.

In the context of health care, Caroline Pelletier and Roger Kneebone (2016) argue that medical training games should be viewed and designed as a form of cultural practice. Such an approach calls on health care game designers to embrace the communicative affordances of games and play, qualities often omitted in medical simulations where designers have valued real-world authenticity over the actual goal of forming and reflecting on the practices of the profession. I took a similar approach in designing *Allergory*. The game's players are put in the position of engaging in practices culturally common among children with food allergies. This was explicitly not a simulation of such an experience. Rather, I reviewed interviews of food-allergic children, identified common situations, and

crafted hyperrepresentative scenarios. I call these scenarios hyperrepresentative because they contain numerous opportunities for players to discover a variety of cultural practices that would not normally appear together in a given moment but nevertheless remain familiar to those with food allergies.

For instance, in one scenario, we find the main character Mia out for a celebratory dinner with her soccer team (see figure 3). As a group, the team orders a pizza, and they decide on one that includes peanut oil in the sauce. The coach, however, has the final say on what gets ordered. Here I brought together a food-allergic child, her peers, and an older authority figure to represent the sometimes challenging dynamic social relationships that children with food allergies need to navigate. Should Mia veto the consensus choice among her teammates and risk her allergy being seen as a detriment that further stigmatizes her identity? Or should she appeal to an authority figure and risk being seen as a tattle? In some sociocultural situations, the best practice might ultimately be a mitigating one. But until individuals experience such situations firsthand, the logic behind these choices—and the additional stress and anxiety that can accompany this process—remains elusive. Praxis games, and their focus on situated praxis, can supplement the absence of those experiences by re-presenting them in a ludic manner.

Design Heuristic 3: Evidence-based Rules

Gameful situations should operationalize research by creating evidence-based rules—that is, rules based on evidence and research. If the goal of a game is to represent the experience of low-income individuals—as in the game *Spent*—designers should base the rules of the game on the average income, expenses, dwelling, and options available to this demographic. Likewise, if the goal is to represent a crisis response within a triage—as in the game *SurgeWorld*—designers should orient the rules governing player interactions around the hospital's existing or revised procedures. When evidence is implemented effectively, the gameful situations in which players find themselves are not only analogous to those (whether actual or ideal) described and documented by researchers, but the practices players discover in these situations parallel those used in the real world. These may be discursive practices (e.g., how to interpret a spike in the price of gas from the perspective of a low-income family) or sociocultural and professional practices (e.g., what is the correct course of action for triage staff during a disaster). As Shaffer (2006) notes in his discussion of epistemic games, the goal should be that "the practices in one community (the game) model the practices in another." (418). Using

Figure 3. In this scenario, Mia attends a group meal. The rest of the team has decided on a Thai pizza, which contains peanut sauce. Mia's sense of safety (represented by one color) and her sense of support (represented by a different color) will determine the player's success at navigating the social dynamics of the situation.

evidence and research in the design and implementation of the rules helps achieve this outcome.

For example, I designed *Allergory* using an evidence-based approach. The game draws on a wide range of research conducted with food-allergic children. But when it came to designing specific rules and interactions, one paper in particular proved particularly insightful—"Illustrating Risk: Anaphylaxis through the Eyes of a Food-Allergic Child" by Fenton et al. (2011). For this article, researchers conducted interviews with food-allergic children in Ontario and provided analysis of their experiences, drawing out the commonalities and shared challenges that the children faced. In particular, children reported three key factors of support or stress in their lives: food safety vis à vis allergens (i.e., safety), the understanding of their peers (i.e., community), and the support of parents, guardians, and teachers (i.e., support). The goal of the game was to foster understanding in non–food-allergic persons by positioning players in social and psychological situations in which food-allergic children often find themselves.

The above factors were incorporated into the rules of the game to ensure that the design adhered to that experience.

More specifically, the three factors of safety, community, and support formed the core mechanic of the game. In *Allergory* players roll virtual dice when making decisions that could improve or undermine the player character's well-being and confidence. A choice to go camping with a friend and her family, for instance, might involve a strong sense of community with the friend and confidence in the support of her parents. In this case, the player would need to roll the community die and the support die, achieving the minimum required value for each. The more socially challenging the situation, the higher the minimum value required. By varying the dice and the minimum values needed, it was possible to re-create a wide array of scenarios that arose in the research. These evidence-based rules then set the stage for players to discover the various sociocultural practices that food-allergic children use to increase their confidence and sense of safety.

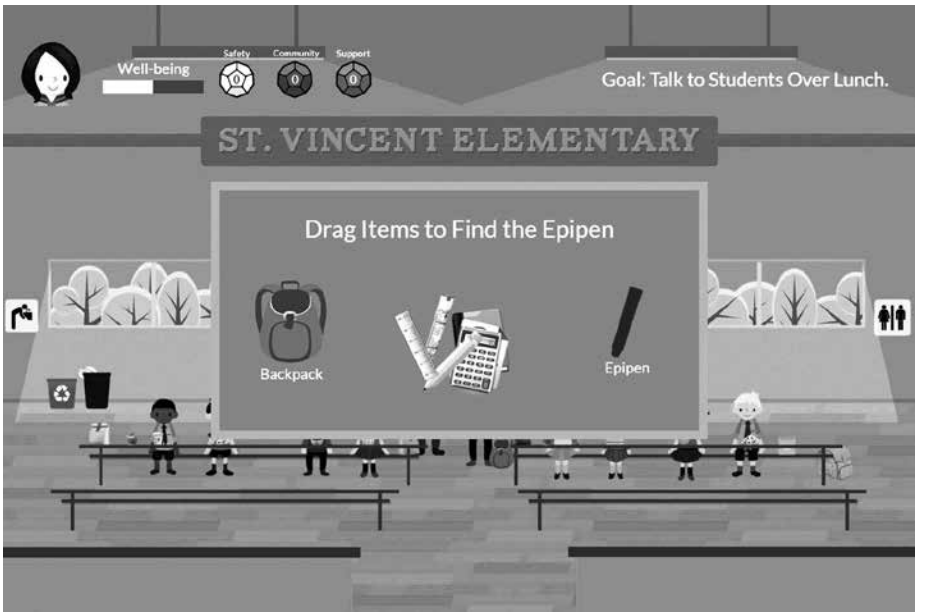

Figure 4. At any point, players can open Mia's backpack and find her epinephrine autoinjector. This small act provides a degree of confidence—knowing that, should there be an incident, the medicine is at hand. This is represented ludically by adding a bonus point to Mia's sense of safety, which will be added to ensuing decisions involving that aspect of her well-being.

Locating one's epinephrine autoinjector or scanning ingredients lists for obscurely worded allergens, for instance, are common practices for those with food allergies. In *Allergory* these practices add bonus points to their respective factors, allowing players to influence the outcomes of particular situations while capturing the relationship between sociocultural practices and the food-allergic child's experience (see Figure 4).

The rules of praxis games, whenever possible, should be informed by the best available evidence. To do otherwise is to risk promulgating disinformation. Consider the game *Spent* previously mentioned. Created for the Urban Ministries of Durham, *Spent* was intended to raise awareness of poverty and homelessness. In the game, players must secure food, rent, and a job with limited financial resources. Game play is made up of largely binary choices, such as do you sell some of your possessions to keep the lights on or keep them and risk having the power shut off? Despite the goal of the game—to foster empathy for those in poverty and to garner donations for charity—a small-scale study found that the game actually reduced empathy even in those already sympathetic to low-income individuals (Roussos 2015). As the study surmises, the game presents personal financial success as a series of rather facile choices, a design decision that exacerbates the misperception that impoverished individuals are simply laggards in the (purported) meritocracy of a capitalist society. The designers failed to consider the wealth of evidence that ties poverty to systemic inequality and discrimination, and, as a result, the experience not only produced apathy instead of empathy, it also furthered a harmful misperception. Thus, evidence-based rules are not just a design decision but can be—and often are—an ethical imperative.

Design Heuristic 4: Guided Discovery

When the rules of a game are based on the best available evidence, the game designer has an opportunity to guide players toward the discovery of knowledge and practices rooted in this information. In fact, it is worth noting that games, by their nature, convey best practices—where "best practices" are thought of as strategies or tactics that lead to optimal game play. When it comes to praxis games, the game should be designed so that it guides players toward the discovery of those practices best suited to a given situation or scenario.

To say that games guide players toward the discovery of best practices is to note the relationships that rules create between possibilities and probabilities. The rules of chess, for instance, dictate all the possible moves a player can

make. However, as players advance from beginner to novice, they learn that, of all the possible moves (i.e., practices) there exists a subset more likely to prove successful (i.e., best practices). In this way, competency and proficiency emerge naturally throughout the course of play as players try out various practices and replace poor practices (i.e., those that move the players further from their goal) with better ones. This guided discovery toward best practices characterizes not only ludic practices (e.g., learning that it is often best to sacrifice a pawn to take out a more powerful opponent) but also of discursive practices (e.g., observing the game board, including the distribution of pieces, and recognizing an opportunity to remove one of your opponent's more powerful pieces).

This notion of guided discovery has roots in classical rhetoric and the rhetorical art of invention. Invention involves studying the commonplaces or common sites of discourse in a community or culture. Those seeking to engage in persuasive communication position themselves—imaginatively or actually—in these commonplaces to discover common interpretations (i.e., discursive practices) situated there. With these discursive practices, rhetors could then anticipate how their words would be received and, as a result, they could craft arguments more likely to persuade their audiences. To assist students in the act of invention, commonplace books appeared—compendiums on specific topics that students could use to discover arguments situated in various sociocultural positions or places.

Praxis games can be thought of as commonplace games or heuristics for training players to discover not only discursive practices, but also sociocultural and professional practices (Wilcox 2016). This is the approach I took in *Allergory*. The seven levels of the game are based on seven common situations in which food-allergic children find themselves, including school lunches, group meals, and food-based festivities. The rules of the game, including the ways in which the dice requirements are weighted toward specific outcomes, guide players toward particular interpretations of the food-allergic child's experience, including the role they play as non–food-allergic persons in making the experience challenging or not.

In addition to rhetorical invention, game designers should also consider guiding their players through "procedural rhetoric" (Bogost 2007)—the ways in which the processes and procedures of a game persuade players to adopt particular beliefs or values. The board game Monopoly, for instance, has players enact various processes and procedures (i.e., buying properties and building rental units to amass a real-estate monopoly) that persuade players to view each

other and the land itself from a particular, capitalist perspective. Designers of praxis games should assess how the processes and procedures of their games shape and condition players to make sense of their experience playing the game. In particular, the procedural rhetoric should be used to guide the player toward the discovery or invention of particular practices.

Design Heuristic 5: Decision Optimization

The fifth and final design heuristic for praxis games builds on the previous four. Praxis games should focus on training players to optimize their decisions in light of the best available evidence. This is achieved by aligning the game's decision-making optimization with the actual or optimal decisions described by individuals, researchers, and experts. In this way, players not only discover situated practices, they also explore a range of them and find those best suited to a particular situation.

As I have noted, games, by their nature, encourage players to adopt not just any practices but optimal or best practices. These optimal ludic practices are the tactics or strategies that prove most useful or successful in a game. Since we are conditioned to strive for ideal outcomes, we have a seemingly natural inclination to root out poor ludic practices and replace them with better ones to improve our chances for success. Praxis games combine this propensity for decision optimization with actual or optimal personal, cultural, and professional practices. This is particularly applicable to those instances when researchers and policy makers seek to distribute revised practices meant to supplement outmoded approaches. *SurgeWorld* and *Night Shift*, for instance, both aim to cultivate ludic practices that are themselves in line with the best practices laid out in medical research. This approach makes designing praxis games distinct from designing simulation-based training. The latter seeks to reproduce an accurate real-world location or situation only to have players intuit the best practices for this location or situation, whereas praxis games use game rules and systems to encourage players to find, test, and revise a range of practices before ultimately realizing which are indeed best and most applicable. Put differently, simulation games are more about creating opportunities to apply knowledge, whereas praxis games focus on creating moments that foster the discovery and application of knowledge.

The heuristic of decision optimization is itself based on situated learning—the theory that we learn by immersing ourselves in and adapting to real or virtual situations. Scholars such as James Paul Gee (2007) have argued that games

themselves are exemplary tools for situated learning. Praxis games should be designed to create a kind of situated play in which adapting to the ludic situation is analogous to adapting to various real-world situations, be they sociocultural, as when players explore novel social or cultural experiences, or professional, as when revised policies prescribe new professional practices. From this perspective, the game designer's role is to create situations in which optimal decisions arise throughout the course of play.

In the game ZombiePox, a board game developed by Tiltfactor and researchers at Dartmouth College, players try to contain an outbreak of a zombie virus. They can either cure an infected person or inoculate them prior to their contracting the virus. Throughout the course of play, players may try various strategies and tactics (i.e., ludic practices), but over time they learn that the best practice is to deploy vaccines rather than to treat viral infections after the fact. Indeed, this was the designer's goal: to teach players the value of vaccines and herd immunity (Kaufman and Flanagan 2015). In this case, adapting to the ludic situation is an adaptation to the real-world, public health situation encountered by both medical practitioners and by public health policy experts seeking to convey the benefits of vaccines.

Praxis games, at their best, ensure that the process of adapting to the ludic situation affords a degree of play, even if it is guided. This was the approach I took with *Allergory*—players are invited to adapt their discursive and sociocultural practices to the common situations in which food-allergic children find themselves. The game anticipates that non–food-allergic players will underestimate the social and psychological labor that accompanies the day-to-day experiences of those with food allergies. Thus simple choices, like with whom to eat lunch or whether to speak out in defense of an allergy, are available to players; however, to follow through on such decisions, the player character needs to feel confident in her personal safety, her sense of community, and in the support of those in positions of authority. As noted previously, because each of these factors is tied to the cast of a die, making a choice requires at a minimum confidence on the part of the player character. In effect, this means that choices in *Allergory* require players to engage with a more nuanced decision-making process. As the literature on food allergies indicates, it is not as simple as making the right choice—most food-allergic children are well versed in their own safety. Rather, a host of social and cultural factors lie beyond the control of food-allergic children and impede them from making the best decisions.

Conclusion

Games have an affinity for bringing together the fundamental elements of learning, such as context, practice, and experience. With careful attention to design and the backing of research and evidence, considerable potential exists for games to assist in efforts to mobilize knowledges and skills. The design philosophy behind praxis games constitutes one approach to exploring that potential. Unlike the edutainment paradigm, praxis games embrace the unique communicative and pedagogical properties of the medium, and the resulting designs are rooted in both classical and contemporary research about how humans learn new knowledge and acquire new skills. Although my discussion articulates this design philosophy in terms of mobilizing knowledge in one particular domain—health care—the methodology and related heuristics allow for the design of games that mobilize knowledges situated in a range of communities, domains, and experiences.

One nascent area of game design that aligns well with the praxis heuristics involves social realism games. Galloway (2006), for instance, connects the social and political role social realism has played in painting, photography, and film with a heretofore underdeveloped movement in games around accurately and ludically depicting various lived experiences and situations within contemporary society. Considerable social and political power lies in depicting society as lived and experienced from various positions and perspectives. But as Galloway points out, games—and especially video games—have traditionally held a very narrow conception of realism, equating it largely with dynamic visual or photorealism (i.e., high-resolution textures, dynamic lighting, three-dimensional environments, and complex physics). It is worth considering whether a social realism movement in games could help ameliorate social inequalities by demonstrating the varying rules and practices society imposes on various identities and communities. As John Scalzi (2012) once noted, being a white straight male is equivalent to playing life on its lowest difficulty setting. Samantha Allen (2013) takes up this notion, describing how her life as a trans woman is equivalent to having difficulty modifiers imposed upon her by sexists, misogynists, and transphobes. Games, perhaps more readily than other media, can capture these various rules and difficulty modifiers, demonstrating not visual realism—about which there is widespread consensus—but the social and psychological realism, which is considerably more diverse and nuanced.

Indeed, a range of games already speaks to the potential of a social realism

movement and can be tied to the praxis heuristics. Anna Anthropy's *Dys4ria*, for instance, depicts the author's psychological and social experience of gender dysphoria and hormone replacement therapy. The game is made up of various levels that depict particularly meaningful or formative social interactions and psychological experiences. These gameful situations involve players who behave according to the rules of Anthropy's past experiences, providing insight into a life made challenging by discriminatory social norms and conventions. In Swetha Kannan's *Stasis,* the designer sought to depict her experience as a woman subjected to street harassment. In this two-dimensional game, players lead a female character along a dark street while men make rude and lewd comments in the form of comic book–style speech balloons. Each baloon has weight and impedes the character's movement; to progress, each comment must be singled out and tossed aside by clicking and dragging it out of the player's path. The central mechanic here captures the psychological toll such comments take—they can weigh on women's mind, impeding them not only physically, as when they are confronted by street harassers, but also psychologically because such demeaning interactions have a deleterious effect on their well-being and self-worth. Thus, in *Stasis,* players are guided toward the psychological experiences of many women—in this case, being forced to acknowledge and repeatedly dismiss their perceived role in society as objects of male desire.

The design principles that undergird praxis games extend to various subjects and experiences, from gender to socioeconomics to politics. In the game *Cart Life,* players take on the role of various street vendors trying to make a living. Being situated in these roles means adopting various, often mundane, practices such as folding stacks of newspapers, procuring meals, and balancing budgets. Such practices are far from the frivolous fun of edutainment, but they nevertheless capture the interest of players, bringing forth knowledge situated in the experience of various low-income persons in modern America. In terms of politics, the game *Papers, Please* emphasizes the communicative potential of the decision optimization heuristics. In this immigration-themed game, players take on the role of a border guard tasked with processing prospective migrants. As in *Cart Life*, the practices are deeply mundane, such as reviewing documents, comparing statements, and stamping papers. But since success in the game, including the welfare of players' families, depends on players' proficiency at these tasks (players earn income for the number of applicants processed), they often adopt various optimization strategies to expedite the process, such as examining only those parts of documents that are relevant to the immigration criteria set

by the state and looking for any excuse to dismiss an ineligible applicant (players are sometimes penalized for allowing those who violate the state's criteria into the game). These optimized decisions coincide with the guided discovery of the game's design. Rules and incentives can—and often do—obviate compassion and basic human decency. Indeed, the game provided an eerily prescient look at the Trump administration's implementation of draconian immigration policies.

By defining a genre of games explicitly composed of the design principles used in these and other titles, praxis games encourage designers and scholars to attend to the situated nature of knowledge and the relationship between knowledges and practices—and, as a consequence, to explore further the types of games that capitalize on this theoretical framework. The next steps in developing this genre are not only to validate further their efficacy but also to explore how best to translate situated knowledges and practices into action. As Frasca (2004) notes in "Videogames of the Oppressed," games have often sought immersion but at the expense of critical reflection. Put differently, understanding does not necessarily yield insight into informed action. Playing *Allergory* or *Papers, Please* can help us understand an issue or situation but they do not necessarily teach how to ameliorate such issues. Critical players will be able to reflect on the meaning of their choices or actions, but what we need are games that also help develop this critical perspective in the first place. Following Frasca's lead and, for better or worse, allowing players to redesign the game, to change the rules and perceive a corresponding change in outcomes, may very well enable games not only to inform players but to guide them toward the meaningful decisions and practices they can use to improve their lives and the lives of others. As a colleague once said to me, people change when they are shown how to change. Games often tell us why we need to change, but perhaps they can also show us how.

References

Akl, Elie A., Victor F. Kairouz, Kay M. Sackett, William S. Erdley, Reem A. Mustafa, Michelle Fiander, Carolynne Gabriel, and Holger Schünemann. 2013. "Educational Games for Health Professionals." *The Cochrane Database of Systematic Reviews* 1.

Alaswad, Zina, and Larysa Nadolny. 2015. "Designing for Game-Based Learning: The Effective Integration of Technology to Support Learning." *Journal of Educational Technology Systems* 43:389–402.

Allen, Samantha. 2013. "The Other Difficulty Mode: What Halo Can Tell Us about Identity and Oppression." *First Person Scholar*. http://www.firstpersonscholar.com/

the-other-difficulty-mode/.
Bazil, Leon. 2012. *Business Games for Management and Economics: Learning by Playing*.
Brown, John Seely, Allan Collins, and Paul Duguid. 1989. "Situated Cognition and the Culture of Learning." *Educational Researcher* 18:32–42.
Bogost, Ian. 2007. *Persuasive Games: The Expressive Power of Videogames*.
Burke, Cecilia Tolentino. 2001. "The Influences of Teaching Strategies and Reinforcement Techniques on Health Care Workers' Learning and Retention." PhD diss., University of Southern Mississippi.
Charsky, Dennis. 2010. "From Edutainment to Serious Games: A Change in the Use of Game Characteristics." *Games and Culture* 5:177–98.
Cole, Michael. 1996. *Cultural Psychology: A Once and Future Discipline*.
Collins, Patricia Hill. 1991. *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment.*
Dicheva, Darina, Christo Dichev, Gennady Agre, and Galia Angelova. 2015. "Gamification in Education: A Systematic Mapping Study." *Educational Technology & Society* 18:75–88.
Edelson, Daniel Choy. 2002. "Design Research: What We Learn When We Engage in Design." *Journal of the Learning Sciences* 11:105–21.
Fenton, Nancy Elizabeth, Susan J. Elliott, Lisa Cicutto, Ann E. Clarke, Laurie Harada, and Elizabeth McPhee. 2011. "Illustrating Risk: Anaphylaxis through the Eyes of the Food-Allergic Child." *Risk Analysis* 31:171–83.
Flanagan, Mary. 2009. *Critical Play: Radical Game Design*.
Frasca, Gonzalo. 2004. "Videogames of the Oppressed: Critical Thinking, Education, Tolerance, and Other Trivial Issues." In *First Person: New Media as Story, Performance, and Game*, edited by Noah Wardrip-Fruin and Pat Harrigan, 85–94.
Fukuchi, Steven G., Laura A. Offutt, Josh Sacks, and Barry D. Mann. 2000. "Teaching a Multidisciplinary Approach to Cancer Treatment during Surgical Clerkship via an Interactive Board Game." *The American Journal of Surgery* 179:337–40.
Galloway, Alexander R. 2006a. "Gamic Action, Four Moments." In *Gaming: Essays on Algorithmic Culture*, 1–38.
———. 2006b. "Social Realism." In *Gaming: Essays on Algorithmic Culture*, 70–84.
Gee, James Paul. 2007. *What Video Games Have to Teach Us about Learning and Literacy*. 2nd ed.
———. 2008 "Learning and Games." In *The Ecology of Games: Connecting Youth, Games, and Learning*, edited by Katie Salen Tekinbaş, 21–40.
Haraway, Donna. 1989. "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." *Feminist Studies* 14:575–99.
Harding, Sandra. 1993. "Rethinking Standpoint Epistemology: 'What is Strong Objectivity?'" In *Feminist Epistemologies*, edited by Linda Alcoff and Elizabeth Potter, 49–82.
Huizinga, Johan. 1970. *Homo Ludens: A Study of the Play Element in Culture.*
James, William. 2014. "The Sentiment of Rationality." In *The Will to Believe and Other Essays in Popular Philosophy,* 63–110.

Jenkins, Henry, and Randy Hinrichs. 2003. "Games to Teach." http://icampus.mit.edu/projects/project/?pname=GamesToTeach.

Kato, Pamela M. 2010. "Video Games in Health Care: Closing the Gap." *Review of General Psychology* 14:113–21.

Kaufman, Geoff, and Mary Flanagan. 2015. "A Psychologically 'Embedded' Approach to Designing Games for Prosocial Causes." *Cyberpsychology: Journal of Psychosocial Research on Cyberspace* 9. http://dx.doi.org/10.5817/CP2015-3-5.

Larsen, Christian R., Jette L. Soerensen, Teodor P. Grantcharov, Torur Dalsgaard, Lars Schouenborg, Christian Ottosen, Torben V. Schroeder, and Bent S. Ottesen. 2009. "Effect of Virtual Reality Training on Laparoscopic Surgery: Randomised Controlled Trial." *BMJ* 338:b1802.

Lave, Jean, and Etienne Wenger. 1991. *Situated Learning: Legitimate Peripheral Participation*.

Lee, Jo-Anne. 1996. "Power, Praxis, Positioning, and Subjectivities." *Atlantis* 21:142–53.

McLuhan, Marshall, and Lewis H. Lapham. 1994. *Understanding Media: The Extensions of Man*.

Mohan, Deepika, Matthew R. Rosengart, Baruch Fischhoff, Derek C. Angus, Coreen Farris, Donald M. Yealy, David J. Wallace, and Amber E. Barnato. 2016. "Testing a Videogame Intervention to Recalibrate Physician Heuristics in Trauma Triage: Study Protocol for a Randomized Controlled Trial." *BMC Emergency Medicine* 16.

Munson, Sean A., Erika Poole, Daniel B. Perry, and Tamara Peyton. 2014. "Gamification and Health." In *The Gameful World: Approaches, Issues, Applications*, edited by Steffen P. Walz and Sebastian Deterding, 597–623.

Murray, Janet Horowitz. 1998. *Hamlet on the Holodeck: The Future of Narrative in Cyberspace*.

Olszewski, Aleksandra E., and Traci Wolbrink. 2016. "Serious Gaming in Medical Education: A Proposed Structured Framework for Game Development." *Simulation in Healthcare* 12:240–53.

Patel, Anuradha, Thomas Schieble, Melissa Davidson, Minh C. J. Tran, Catherine Schoenberg, Ellise Delphin, and Henry Bennett. 2006. "Distraction with a Hand-Held Video Game Reduces Pediatric Preoperative Anxiety." *Pediatric Anesthesia* 16:1019–27.

Pelletier, Caroline, and Roger Kneebone. 2016. "Playful Simulations Rather Than Serious Games." *Games and Culture* 11:365–89.

Ramirez, Dennis, and Kurt Squire. 2014. "Gamification and Learning." In *The Gameful World: Approaches, Issues, Applications*, edited by Steffen P. Walz and Sebastian Deterding, 629–52.

Redd, William H., Paul B. Jacobsen, Maria Die-Trill, Helen Dermatis, Maureen McEvoy, and Jimmie C. Holland. 1987 "Cognitive/Attentional Distraction in the Control of Conditioned Nausea in Pediatric Cancer Patients Receiving Chemotherapy." *Journal of Consulting and Clinical Psychology* 55:391–95.

Rosser, James C., Jr., Paul J. Lynch, Laurie Cuddihy, Douglas A. Gentile, Jonathan Klonsky, and Ronald Merrell. 2007. "The Impact of Video Games on Training Surgeons

in the 21st Century." *Archives of Surgery* 142:181–86.
Ruggiero, Dana, and William R. Watson. 2014. "Engagement through Praxis in Educational Game Design." *Simulation & Gaming* 45:471–90.
Roussos, Gina. 2015. "When Good Intentions Go Awry: The Counterintuitive Effects of a Prosocial Online Game." *Yale Institution for Social and Policy Studies* (blog). https://isps.yale.edu/news/blog/2015/10/the-counterintuitive-effects-of-a-prosocial-online-game-when-good-intentions-go.
Scalzi, John. 2012. "Straight White Male: The Lowest Difficulty There Is." *Kotaku*. https://kotaku.com/5910857/straight-white-male-the-lowest-difficulty-setting-there-is.
Shaffer, David Williamson. 2006. *How Computer Games Help Children Learn*.
Swain, Chris. 2010. "The Mechanic is the Message: How to Communicate Values in Games through the Mechanics of User Action and System Response." In *Ethics and Game Design: Teaching Values through Play*, edited by Karen Schrier and David Gibson, 217–35.
Tekinbaş, Katie Salen, and Eric Zimmerman. 2004. *Rules of Play: Game Design Fundamentals*.
Telner, Deanna, Maja Bujas-Bobanovic, David Chan, Bob Chester, Bernard Marlow, James Meuser, Arthur Rothman, and Bart J. Harvey. 2010. "Game-Based versus Traditional Case-Based Learning: Comparing Effectiveness in Stroke Continuing Medical Education." *Canadian Family Physician* 56:345–51.
Van Eck, Richard. 2006. "Digital Game-Based Learning: It's Not Just the Digital Natives Who are Restless." *EDUCAUSE Review* 41:16–30.
Vasterling, Jennifer, Richard Jenkins, Denise Matt Tope, and Thomas G. Burish. 1993. "Cognitive Distraction and Relaxation Training for the Control of Side Effects Due to Cancer Chemotherapy." *Journal of Behavioral Medicine* 16:65–80.
Wang, Rui, Samuel DeMaria, Jr., Andrew Goldberg, and Daniel Katz. 2016. "A Systematic Review of Serious Games in Training Health Care Professionals." *Simulation in Healthcare,* 11:41–51.
Wikipedia contributors, "Praxis," *Wikipedia, The Free Encyclopedia*. https://en.wikipedia.org/w/index.php?title=Praxis&oldid=865360774.
Wilcox, Stephen. 2016. "Uncommon Places: The Multimodal Art of Embodied Invention." PhD diss., University of Waterloo.
Zimmerman, Eric, and Heather Chaplin. 2013. "Manifesto: The 21st Century Will Be Defined by Games." *Kotaku*. http://kotaku.com/manifesto-the-21st-century-will-be-defined-by-games-1275355204.