

# Gameful Situations

## Designing Games for Acquiring New Skills and Knowledges

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Prepared for VEGA – Violence, Evidence, Guidance, Action, June 2017

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### Introduction

How humans acquire new knowledge has inspired inquiring minds for millennia. Centuries of research and analysis has produced a wide range of theories and methods. Despite the differences there are particular qualities that are common throughout this body of scholarship. Those qualities include *context* (i.e. we tend to learn best when knowledge is situated in a particular context), *practice* (i.e. we embody new knowledge by applying what we've learned for ourselves), and *experience* (i.e. we better retain knowledge that is discovered through experience). These qualities arise at various points in our day-to-day lives, from the playground to the classroom to the office. However, this raises the question as to whether we could design such practice-based situations in order to facilitate acquiring new skills and knowledges.

Here games—understood as designed experiences—enter the discussion. Games, by their nature, include all three

of the aforementioned epistemological qualities. They create unique contexts or situations through their rules; they encourage players to not only practice but to create practices (i.e. strategies, tactics, schemas, etc.); and they communicate through the experience of playing. It follows that games make unique epistemological tools in that they incorporate the fundamental qualities of learning into their very form and structure. Perhaps this is why James Paul Gee refers to game design as “applied learning theory” (Gee 2008).

In this whitepaper games are viewed as tools for acquiring new knowledge through *gameful situations*. Games are suited to this task because they allow us to engage in various forms of *situated praxis*. Praxis here refers to “the process by which a theory, lesson, or skill is enacted, embodied, or realized” (“Praxis,” 2017). To speak of praxis as situated is to note that the practices by which knowledges are constructed vary between bodies, communities, and cultures (Haraway 1988; Harding 1993;

Lave & Wenger 1991; Collins 1991). Games engage players in situated praxis by creating a context or situation in which various ludic, social, cultural, and/or professional practices arise. This can be seen in the broad range of commercial games, both analog and digital. That most of these games teach us practices that do not extend beyond the game itself does not diminish the potential for novel games to achieve such a feat—that is, for designers to create games where the practices players learn reach beyond the game into their personal, social, and professional lives. This is the goal of designing gameful situations.

Gameful situations are pedagogically-rich learning environments in which players are guided towards the discovery of various practices. From a genre perspective, gameful situations are a kind of *epistemic game* (Shaffer 2006)—games concerned with the acquisition of new knowledge. More specifically, gameful situations are based on feminist epistemology and the concept of *situated knowledges*. Scholars such as Donna Haraway (1988) and Sandra Harding (1993) have argued that knowledges are situated through the social, cultural, and/or professional practices of various communities and cultures. From this perspective acquiring knowledge is first and foremost a process of discovering the practices by which knowledge a body of knowledge was produced. Games—a medium typified by the acquisition of novel practices, such as

tactics, strategies, and skills—can help facilitate the translation of situated knowledges. They achieve this feat in two ways: 1) by sharing practices common to various communities and cultures they can facilitate the flow of culturally-situated knowledges and 2) by sharing best practices, such as those recommended by domain experts, they can facilitate the flow of knowledge situated in evidence and research.

At the core of this paper is a series of four situational game design heuristics. These heuristics can assist game developers, both amateur and professional, as well as educators, journalists, medical professionals, policy makers, and many others in creating game-based curricula that utilize the affordances of the medium to foster knowledge acquisition. These heuristics include:

- *Gameful situations*: Gameful situations are rule-bound spaces in which gameplay is an on-going process of situating oneself and one's knowledge and skills within a novel social, cultural, and/or professional context.
- *Evidence-based rules*: Gameful situations operationalize research by creating evidence-based rules, ensuring that players find themselves in situations analogous to those described and documented by researchers—be them actual or ideal.

- *Guided discovery*: Games, by their nature, imply best practices—strategies or tactics for optimal gameplay. In designing gameful situations the rules are implemented in such a way that they guide players towards the discovery of those practices best suited to a given situation or scenario, be it social, cultural, and/or professional.
- *Decision optimization*: Gameful situations facilitate the dissemination of best practices by aligning the game’s decision-making optimization (i.e. those strategies and tactics that prove successful in-game) with the optimal decisions described by experts in a given area of practice.

To be clear, the approach here is not to suggest that games can or should supersede other forms of knowledge acquisition; rather the goal is to recognize games as underutilized tools that can assist in the larger effort of closing the gap between knowledge producers and knowledge users.

In what follows I outline some key terms and concepts from the areas of game design, media theory, and game-based learning, drawing on relevant research that can help contextualize the novelty and utility of gameful situations. I then detail the four design heuristics for creating such games, drawing on a variety of projects as evidence.

## Terminology, Theories, and Concepts

### *Edutainment and Professional Training Games*

While gameful situations are a relatively novel approach to teaching, there is a precedent for blending games, learning, and knowledge acquisition. Professional training games, such as team building exercises and online training modules, have existed for some time now and are quickly becoming a mainstay for instructing new employees. Similarly, educators have long looked 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/or overly punitive games. While professional training games have received less scholarly attention (for business see Bazil 2012; for healthcare Wang et al 2013; Akl et al 2013), there is a considerable body of research on edutainment that is critical of edugames (Van Eck 2006; Charsky; Jenkins & Hinrichs 2003; Alaswad & Nadolny 2015; Dicheva et al 2015).

Across both professional training game and edugames criticism is not directed at games themselves but the approach game designers have taken thus far. By far the most common critique is that designers overlook that ‘the medium is the message’ (McLuhan 1964). As Jenkins and Hinrichs note in their *Games to Teach* research, “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” (Jenkins & Hinrichs 2003). This practice of ‘re-skinning’ a game to include educational content—such as replacing generic facts with domain-specific knowledge in a game of *Trivial Pursuit*—remains prevalent, doing a disservice to the medium and its capacity to situate players in unique learning environments in the process. Most edutainment critics note that the real pedagogical potential for games lies in utilizing their capacity to represent uniquely gameful situations, such as complex systems, dynamic interactions, and branching narratives (Bogost 2007; Zimmerman 2013; Murray 1997). In order to explore this potential, game designers will need to develop novel rules and mechanics specific to the subject matter they seek to convey. Thus, as Swain puts it, when it comes to game design ‘the mechanic is the message’ (Swain 2010).

Game mechanics refer to the actions and operations prescribed by the rules of the game; they are the principal practices that a player engages in when situated within a game space. In a game of cribbage, for instance, one of the core mechanics involves building a hand of playing cards that add up to fifteen in various combinations. This mechanic is a prescribed practice as the rules of the game reward those players who can count off the most card combinations adding to fifteen at the end of each

round. Traditionally, professional training and edutainment designers look at popular game mechanics and see a means of generating interest, excitement, and/or fun. From this perspective they select an existing game (e.g. *Jeopardy*, *Snakes and Ladders*, etc.) and then attach domain-specific knowledge to those existing game mechanics, a move that assumes that form and content are distinct.

As a child I recall playing an edutainment version of *Asteroids*—a classic arcade game where a spaceship must shoot approaching asteroids or be destroyed. In the version I played you ‘fired’ numerical answers to ‘destroy’ approaching equations. In this case the mechanic of the game was conveying one message—you are an imperiled pilot of a spaceship—while the designers were trying to convey another—you are a learner of basic arithmetic. This design methodology is derisively referred to 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 it has become clear that games have far more potential than merely acting as mechanisms for delivering unrelated content. Components of game design like mechanics, narrative, choice, player-driven exploration, and trial-and-error are not simply a means to the

educator's ends but rather they 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 where the medium is used to convey the message. In this revised version players take on the role of a software engineer on the spaceship where the computer targeting system is malfunctioning. Your task is to debug the code, which happens to involve fixing some mathematical errors. As you debug the code, the targeting system becomes more accurate, allowing the crew to better protect the ship. Here the narrative is being used to situate 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 in order to save the ship. This gameful situation of the player creates a context in which learning and play mutually reinforce one another, contrasting the edutainment model where play is interpreted as fun and learning as largely unrelated labour. This was the approach taken by the developers of *science.net*. In this game players take on the role of reporters working for an online science-based magazine. As Shaffer (2006) details, this epistemic game teaches grade schoolers the common professional practices of journalists, ranging from storytelling to copyediting, by situating

them as actors or agents within the profession itself.

This shift away from games as simple content delivery mechanisms towards 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* for instance). From a research perspective this novelty poses an interesting challenge as serious game designers recognize but are not yet proficient at using the communicative affordances of the medium. Meanwhile, skeptics understandably look onward for evidence of the effectiveness of serious games over their predecessors. In this regard, games and healthcare offer particularly paradigmatic representations of the pitfalls and promises of games that can teach and train.

Healthcare presents a unique environment to explore game-based learning because medical professionals are required to undergo both training (e.g. medical education) and retraining (e.g. evidence and research) at fairly regular intervals. As a corollary, patients too should engage with the latest medical research when appropriate. Serious games can play a role in these efforts when they are rooted in both the best practices for the profession and the latest evidence that informs those practices. In surveying the healthcare

games field, one finds both the legacy of edugames and a turn towards more sophisticated game designs.

In healthcare commercial games have long been recognized for their capacity to provide therapy (Redd et al., 1987; Vasterling, Jenkins, Tope, & Burish, 1993; Patel et al., 2006) and train the dexterity of surgeons (Larsen et al; Rosser et al., 2007). However, when it comes to games designed specifically for training medical professionals, edutainment remains a recurrent theme. For instance, when Akl et al (2013) cast doubt on the capacity for games to train medical professionals they do so after evaluating two edutainment products: one, a game based on the TV program *Family Feud* and the other an edugame based on *Snake and Ladders*. Their conclusions, which cast doubt on the prospect of using games for training health professionals, are hardly surprising given both the amateur design of the games and the literature on edutainment.

When curricula creators pair educational content with unrelated game mechanics the resulting experiences often lack *meaningful play* (Tekinbaş and Zimmerman) as the repurposed game mechanics do little to support the specialized content. The lack of meaningful play is one reason that researchers have had a mixed response to healthcare-related games. For example, Wang et al (2016) review the role of serious games in medical education, concluding that the field

shows promise but lacks a cohesive method for developing and evaluating effective games. In Kato's comprehensive review of games for health (2010) she concludes 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).

There are medical games that 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 multi-disciplinary nature of cancer care. Researchers found that those who played *Oncology Game* were able to answer more questions correctly over their non-game-playing peers (Fukuchi, Offutt, Sacks, & Mann, 2000).

More recently, designers of healthcare games have begun focusing on specific situations or 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 over less critical but still imperiled people (Swain 2010). Similarly, players of *Night Shift* learn the best practices for properly assessing and treating critical injuries, tackling the issue of diagnostic errors in emergency care (Mohan et al 2016). These games show more promise over their edutainment predecessors as players encounter situations designed to teach them to assess their circumstances and pursue the appropriate practices, as opposed to arbitrary situations (e.g. landing on a space in a board game) that call for recollecting previous learned knowledge (e.g. a piece of medical trivia).

As Wang et al (2016) and Kato (2010) suggest, games should be looked to as a means of mobilizing knowledges and resources. However, lest we fall prey to the same pitfalls that undermined edutainment, games should not be thought of simply as content delivery mechanisms. Furthermore, knowledge should not be conceived of as content to be distributed. The movement of knowledge requires considerable effort, oftentimes paired with experience and practice. Games, understood as designed experiences, can play a prominent role in this process by transforming the cognitive labour involved in knowledge acquisition into an act of *gameful discovery*.

### *Gameful Discovery*

Gameful discovery recognizes the process of discovering a novel strategy,

tactic, or skill (i.e. a practice) within the context of a game as a promising pedagogical exercise. These moments of situated discovery occur in a broad range of games. For example, beginner chess players engage in gameful discovery when they discover the *fool's mate*. This strategy allows the player to put their opponent into checkmate in just two moves, an enticing prospect for chess initiates. However, over time players learn that the fool's mate is a practice with limited applicability as even moderately seasoned players know how to avoid falling into this trap. Thus, discovering the fool's mate strategy involves both learning how it is executed *and* those situations or scenarios when it is best deployed. What this example illustrates is the capacity for games to convey highly contextual or situated knowledge in an intuitive, experiential manner.

Designing serious games around gameful discovery aims to create such moments not for ludic practices (e.g. the fool's mate) but for social, cultural, and/or professional practices and situations. When designed effectively, such games ensure that the practices that players develop for understanding the game and its rules (e.g. ludic practices such as strategies and tactics) are, at one and the same time, practices for understanding personal, social, and/or professional situations (e.g. discursive, social, and cultural practices). In *SurgeWorld*, for instance, players develop various ludic practices such as creating in-game priorities and

assigning tasks to in-game personnel according to the state of the triage. But unlike the fool's mate, these ludic practices are readily transferrable into professional practices as players can repurpose their ludic decision making processes for analogous real-world scenarios. Viewed in this way, designing gameful situations is the process of creating a sense of place or situation in which certain practices arise and others do not.

In game studies the situation created by a game is referred to as *the magic circle* (Huizinga 1970)—that unique sense of place that we experience when playing a game. Designing gameful situations involves reconceptualising the magic circle as an epistemological situation in which the designer positions the player with the express intent of having the player discover knowledge of that situation, including any practices related to that knowledge. This approach to game design is based in *situated learning theory*. Situated learning argues that we learn by immersing ourselves in and adapting to real or virtual situations. Scholars such as James Paul Gee have argued that games themselves are exemplary tools for situated learning (2007).

As Gee points out, games excel at situated learning in part because they involve players in *communities of practice* (Lave and Wenger 1991)—social groups that work collectively and communally to create and share knowledge and practices related to their

hobby or profession. From this perspective games can be thought of not only as a medium for sharing a set of practices—think of how the rules of chess dictate an array of moves, tactics, and strategies (i.e. practices)—but also as tools for fostering participation in real-world communities—think of how the school children who played *science.net* discovered the journalistic practices that would one day allow them to participate in the journalism community.

### *Situated Praxis*

The design of gameful situations should aim to engage players in some form of *situated praxis*. As noted above, praxis refers to “the process by which a theory, lesson, or skill is enacted, embodied, or realized” (Wikipedia). Situated praxis recognizes that different situations—be them bodily, social, cultural, and/or professional—call for distinct forms of praxis. For instance, many role-playing games involve teams comprised of interdependent character classes. The tank class doles out and receives damage, while the healer class ensures that the tank stays alive. These unique roles and the skills associated with them create equally unique situations in the game leading to the discovery of distinct practices. It is a common practice for the tank, for instance, to be at the front of a party when entering a battle as they are best equipped to weather the enemies' blows. Conversely, it is common practice for the healer to stay at the back of a party to avoid the fracas while healing party members from a distance.

Players can be told these common practices but more often than not they learn them through situated praxis as their experience playing the game brings forth knowledge of their situation in the game world, along with the practices that accompany that situation. The same principle holds true in social, cultural, and professional settings.

For instance, while 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—i.e. to discover those practices endemic to those situations—but can also foster understanding between situations as players come to understand the practices used by their colleagues. This is similar to how gamers who have played different classes and roles have a deeper understanding of the behaviour of their fellow party members—their practices make sense because the player recognizes the unique situation that that role/class occupies.

As a concept, praxis has a recognized and theorized role within game-based learning. In “Engagement Through Praxis in Educational Game Design” (2014) Ruggiero and Watson identify praxis as a key component of both game design and game play, drawing evidence from a broad range of educational game developers and their

processes. The authors look to Freire’s (1986) definition of praxis as “reflection and action upon the world in order to transform it” (36) in order to emphasize that gameplay is fundamentally concerned with the cycle of acting, reflecting, and re-acting.

In the context of healthcare, Pelletier and Kneebone (2016) argue that medical training games should be viewed and designed as a form of *cultural practice*. Such an approach calls on healthcare game designers to embrace the communicative affordances of games and play, qualities that are often omitted in medical simulations where game designers have valued real-world verisimilitude over the actual goal of forming and reflecting on the practices of the profession.

In the context of this paper praxis draws inspiration from feminists such as Collins (1991) and Lee (1996) who have used the term to describe the relationship between knowledge, action, and context. Lee (1996), for instance, writes that “[t]he term praxis is used to describe the simultaneous linking of research, as a form of knowledge production, with activism for positive social change” (142). Among feminist scholars, praxis is often viewed as divergent across the various and intersecting social and cultural locations individuals occupy. Situated praxis, within the context of game-based learning, seeks to build on this relationship between praxis and place through the concept of play.

Play within gameful situations focuses on creating and reinforcing the relationship between discursive practices (i.e. how to make sense of or interpret a particular situation) and socio-cultural practices (i.e. how to act on those interpretations in that situation). For instance, the discourse surrounding hospital triages during crises will teach you how to recognize various scenarios that only arise during disasters (i.e. discursive practices). This discourse will also provide instruction on how to act according to these various situations (i.e. professional practices). What you won't be asked to do while reading this literature is to connect your discursive practices with socio-cultural ones—that is, to explore how you interpret a situation with how best to act in that situation.

Games are unique in this respect in that they allow players to explore their discursive practices and how they give shape and meaning to their socio-cultural practices (i.e. how their interpretation of a situation conditions their response to that situation). From this perspective ludic practices—those strategies and tactics learned through play—take on new significance as they represent practices that have been allocated to particular situations or scenarios in the mind of the player. Thus, in a manner of speaking, gameplay is an on-going process of situating knowledges and practices, making them ideal tools for fostering the acquisition of new knowledges and better practices.

What's more, games encourage players to adopt not just any practices but the best practices. Such optimal ludic practices are those tactics or strategies that prove most useful or successful in the 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 one's so as to improve our chances for success. This can be applied to those instances when researchers and policy-makers are seeking to disseminate novel practices. *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 gameful situations distinct from simulation-based training. Such games often seek to reproduce an accurate real-world location or situation only to have players intuit the best practices for that situation. Put differently, simulation games are more about creating opportunities to apply knowledge, whereas gameful situations focus on creating moments that foster the discovery and application of knowledge.

With these broad concepts in mind, the next section lays out specific design heuristics for creating gameful situations.

## Four Situational Game Design Heuristics

Design heuristics are a way for designers to share their game design theories and practices with other creators, researchers, and players. Ramirez and Squire, for instance, offer ten heuristics for designing learning games, including motivate persistence, promote mastery, encourage exploration of new systems, and reframe gameplay experience to promote reflection, among others.<sup>1</sup> 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 the learning sciences. Gameful situations can be seen as a subgenre of learning games and so they inherit a number of these heuristics and practices. However, gameful situations have a specific goal in mind—to have players discover and actualize knowledge and practices through gameplay—and as such specific design heuristics are needed.

The following four heuristics highlight the affordances games have for discovering situated knowledges and

practices. These heuristics appear implicitly in a number of existing games but they were also used explicitly in the creation of *Allergory*, a knowledge translation game I developed as part of my doctoral thesis. Here *Allergory* will be used, among other games, to help illustrate the following heuristics.

### *Design Heuristic #1: Gameful situations:*

Humans are situated creatures. Our cognition is situated through our bodies (Brown, Collins, and Digid 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 and situating knowledges and practices therein. For this reason it is useful to create gameful situations—rule-bound spaces in which gameplay is an on-going process of situating oneself and one’s knowledge and skills within a novel social, cultural, and/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 ability to interact with the game world in unique ways. In short order players find themselves thinking through the distances Mario can jump, the speed at which he can run, the heights he can reach, the walls he can

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<sup>1</sup> Ramirez and Squire’s ten heuristics for designing learning games: provide feedback on progress; promote transparency in assessment; motivate persistence; promote mastery; encourage risk taking; encourage exploration of new systems; reframe gameplay experience to promote reflection; make knowledge flexible; encourage collaboration.

scale, etc. Such players not only grasp this unique logic but they will apply it repeatedly as they solve the various problems and obstacles the game throws before them. Another way to describe this process is to say that players are situating themselves in Mario's world; their experience playing the game brings forth knowledge and practices endemic to that world. For example, there are certain gaps between platforms that Mario simply cannot jump between. And yet the design of the level implies there must be a way across. In this situation players soon discover the practice of running-and-jumping, the momentum from which is enough to span the gap between distant platforms. Once such a discovery is made, players will begin recognize similar situations where the practice of running-and-jumping is required and intuitively employ it. In this way *Super Mario* games can be seen to convey knowledge and practices that are situated within the game world.

In contrast to commercial entertainment games like *Super Mario*, gameful situations are designed with the explicit purpose of mobilizing knowledge that is extra-ludic or external to the game itself. In the food allergy research conducted by Fenton et al (2011) a number of situations unique to the food allergic child's experience were identified. However, such situations—such as school lunches, group meals, family dinners, and holiday gatherings—are unique not in the abstract sense—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 those situations, using the rules of the game to ensure a degree of socio-cultural verisimilitude by constraining player interactions to those discursive and ludic/socio-cultural practices that arise for food-allergic children in those situations. Those practices include carefully reading food labels, defusing social situations that involve allergens, and training peers and guardians in the nuances of food allergies. More generally speaking, gameful situations are opportunities for the designer to create learning environments 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.

Based on the above description, one might be inclined to believe that such games should aim reproduce exactly the situation being emulated. However, the goal of gameful situations is not to simulate an actual experience; rather, gameful situations train the mind to adapt to and develop practices for thinking through novel experiences. Consider *Depression Quest*, a game created by those with depression aimed at providing insight into the mental condition. In this interactive fiction game players are presented with numerous choices, including those that resemble suggestions typically offered by well-meaning friends, co-workers, and family

members. These choices—rooted as they are in the popular discourse on depression—are often facile decisions to ‘feel better,’ to (supposedly) shake off one’s chemical imbalances and embrace happiness over depression. In order to emphasize the inapplicability of these practices to the actual experience of depression, the designers of *Depression Quest* present them as options that have been struck through. The player can read them, just as most depressed individuals know them and might think of them often, but they cannot be chosen, reflecting that they have no practical application within the experience of the depressed individual. In this way the creators of *Depression Quest* have situated conventional knowledge and practices on depression within the physiological and social experience of those with depression, showing that some things fail to translate. What games like *Depression Quest* demonstrate is that gameful situations can help players to better understand knowledge situated in practical experience even when the game itself is an abstraction.

#### *Design Heuristic #2: 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 around the average income,

expenses, dwelling, options, etc. of that 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 (training) or revised (retraining) procedures. When evidence is implemented effectively, the gameful situations players find themselves in are not only analogous to those described and documented by researchers (be them actual or ideal) but the practices players discover in those situations will 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 socio-cultural/professional practices (e.g. what is the correct course of action for triage staff members during a disaster). As Shaffer 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). Utilizing evidence and research in the design and implementation of the rules help achieve this outcome.

For example, *Allergory* was designed 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, a single paper was used—“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 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 a vis* allergens (i.e. safety), 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 the social and psychological situations that food-allergic children often find themselves in. 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 *Allergy* 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. 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 socio-cultural practices that food-allergic children use to increase their confidence and sense of safety. Locating one's epinephrine auto-injector or scanning ingredients lists for obscurely-worded allergens, for instance, are common practices for those with food allergies. In *Allergy* these practices add bonus points to their respective factors, allowing players to influence the outcomes of certain situations while capturing the relationship between socio-cultural practices and the food-allergic child's experience.

The rules of gameful situations, whenever possible, should be informed by the best available evidence. To do otherwise is to risk promulgating disinformation. Consider the game *Spent*. 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. Gameplay is made up of largely binary choices—do you sell some of your possession to keep the lights on or retain 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 the charity—a small-scale study found that the game actually reduced empathy even in those who were already sympathetic (Roussos 2015). As the author of the study surmises, the game presents personal financial success as a series of rather

facile choices, a move that exacerbates the misperception that impoverished individuals are simply laggards in the (supposed) 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 #3: Guided Discovery*

When the rules of a game are based on the best available evidence the game designer has an opportunity to guide players towards the discovery of knowledge and practices rooted in that evidence. 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 gameplay. In the design of gameful situations the game should be designed in such a way that it guide players towards the discovery of those practices best suited to a given situation or scenario.

To say that games guide players towards 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 is a subset that are

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 player further from their goal) with better ones. This guided discovery towards best practices is true not only of ludic practices (e.g. learning that it is often best to sacrifice a pawn to take out the opponent’s queen) but discursive practices as well (e.g. observing the game board, including the distribution of pieces, and recognizing an opportunity to remove the opponents most powerful piece).

The notion of guided discovery has its 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. Rhetors would position themselves—imaginatively or actually—in these commonplaces in order to discover common interpretations (i.e. discursive practices) situated within those places. With these discursive practices in mind a rhetor could then anticipate how their words would be received and as a result they could craft arguments more likely to persuade their audiences. In order to assist students in the act of invention commonplace books were developed—compendiums on specific topics that students could study to train their minds to discover arguments situated in various socio-cultural positions or places.

Gameful situations can be thought of as commonplace games or heuristics for training the minds of players to discover not only discursive practices, but socio-cultural and professional practices as well. This is the approach taken in *Allergory*. The seven levels in the game are based on seven common situations that food-allergic children find themselves in, including school lunches, group meals, and food-based festivities. The rules of the game, including the ways in which the dice are weighted towards specific outcomes, guide players towards particular interpretations of the food-allergic child's experience, including the role they play as non-food-allergic persons in making that experience challenging or not.

In addition to rhetorical invention, game designers should also consider the role of *procedural rhetoric* (Bogost 2007)—the ways in which the processes and procedures of a game persuade players to adopt certain beliefs or values. The boardgame *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 gameful situations should assess how the processes and procedures of their game shape and condition how players make sense of their experience playing the game. In particular, the procedural rhetoric should be used to help guide the player towards particular practices.

#### *Design Heuristic #4: Decision Optimization*

The fourth and final design heuristic for gameful situations builds on the previous three. Gameful situations 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 optimal decisions described by researchers and experts in a given area of practice.

As noted above, games, by their nature, persuade players to optimize their decision-making by discovering the practices best suited to a given situation or scenario. This occurs through the game's design and rules which dictate how certain actions, choices, and decisions (i.e. practices) lead to particular outcomes—be them positive and desirable or negative and undesirable. Gameful situations combine the medium's propensity for decision optimization with personal, cultural, and professional practices described by researchers.

This heuristic is based on the aforementioned concept of *situated learning*—the theory that we learn by immersing ourselves in and adapting to real or virtual situations. Gameful situations 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 them socio-cultural, 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 the optimal decisions arise throughout the course of play.

In the game *ZombiePox*, a board game developed by Tiltfactor and researchers at the University of Dartmouth, players are trying to contain an outbreak of a zombie virus. They can either cure an infected person or inoculate them prior to 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 trying to treat viral infections after the fact. In fact, this was the designer's goal: to teach players the value of vaccines and herd immunity (Kaufman & Flanagan 2015). In this case adapting to the ludic situation is, at one and same time, an adaptation to the real world public health situation encountered by medical practitioners and public health policy experts seeking to convey the benefits of vaccines.

Where possible, gameful situations should ensure that the process of adapting to the ludic situation is one that affords a degree of play, even if it's guided. This was the approach taken with *Allergy* where players are invited to adapt their discursive and socio-cultural 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 labour that accompanies the day-to-day experiences of those with food allergies. And so simple choices, like who to eat lunch with or whether to speak out in defence of one's allergy, are available to players; however, in order to follow through on such decisions the player character needs to feel confident in her personal safety, her sense of community, and the support of those in positions of authority. As noted above, each of these factors is tied to a die, such that making a choice requires a minimum sense of confidence on the part of the player character. In effect this means that decision making in *Allergy* requires that players 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 it is the host of social and cultural factors that are beyond the control of food-allergic children that impede them from making the best decisions.

Ultimately, those seeking to foster knowledge acquisition and optimize decision making should look to games for their natural propensity for achieving both outcomes. More specifically, when the ludic situation—and the practices such a situation persuades the player to adopt—parallels an actual or ideal situation gameplay can be seen as a mechanism for guiding players towards

making the right decisions at the right time.

## Conclusion

Games have an affinity for creating environments designed to teach and inform. With careful attention to design and the backing of researchers and evidence, there is considerable potential for serious games to facilitate the acquisition of new knowledge and skills—this is especially true in areas such as medical training and healthcare, where numerous researchers have noted a promising role for games (Kato 2010; Olszewski 2016; Pelletier & Kneebone 2016; Munson et al 2014).

While there remains a lack of studies confirming this potential, this is not unexpected given that the medium is still maturing. As individuals and organizations move away from edutainment models towards those that view games themselves as unique communicative media, a clearer picture will emerge as to what role games will play in teaching and learning in the twenty-first century. Approaching the design of such games as gameful situations provides a strong practical and theoretical basis rooted in both classical and contemporary research on how humans learn new knowledge and acquire new skills.

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