5.6 Why Games Work and the Science of Learning

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Abstract. In 2010, the Navy formally added the Damage Control Trainer (DCT) to the recruit training program at Great Lakes, Illinois. Despite the incredibly dense training schedule at the Navy's boot camp, the instructors were willing to set aside two hours of time for recruits to play a game. Why? Because it worked. Even with just one hour of play, research showed that recruits gained a 50-80% improvement in performance that transferred to Battle Stations 21 (BS21), the Navy's capstone training event. This paper explores why games makes these kinds of results possible. It argues that the things that are known to improve learning are almost exactly the same reasons why games work: the time-honored laws of learning. It concludes that the traditional gulf between instructional design and game design is really an issue of perspective, rather than fundamentals.

1.0 INTRODUCTION

This paper will examine learning games, which is the use of games to introduce material, improve understanding, or increase retention. A lot of research has been done on learning games in recent years, and the results are sometimes nothing short of amazing. As an example, consider the Navy's Damage Control Trainer (DCT). In our studies of DCT, we showed a 50-80% improvement in individual recruit performance after just one hour of game time [1,2].

We performed a number of studies around the DCT that taught us a lot about building effective games, using games in a curriculum, and working in interdisciplinary teams [1,2,3,4]. That research has already been studied, collated, and published elsewhere. Therefore, this paper will not talk much about the DCT trainer itself or its development. Instead, it will present a new realization about game design that was uncovered while developing the DCT.

1.1 Thesis

Games like the Navy's DCT demonstrate that learning games can work. Therefore this paper will look past the question of 'can games work' and focus instead on the question of 'why they work.' It begins by exploring the laws of learning. These are the basic tenets that are known to improve learning outcomes [5,6]. Then, it will look at the basic tenets of game design - the techniques that lead to good games.

Comparing these two sets of tenets will uncover a surprisingly strong connection between learning and game design. In fact, it answers the original question. Games work because of the laws of learning. In other words, the things that are known to improve learning are almost exactly the reasons why games work. The goal of this paper is to help bring these two fields closer together by showing that the differences between learning and game design are mostly a matter of perspective, not of fundamentals.

2.0 THE LAWS OF LEARNING

Almost 100 years ago, Edward Thorndike described three basic laws of learning: readiness, exercise, and effect [5,6]. Since then, three additional laws have been added to the list: primacy, intensity, and recency [5,6]. Together, these six ideas are known as the laws of learning and they help us to understand how people learn and what conditions help them to learn better. These ideas have persisted through decades of research and study, and are still regarded as fundamental aspects of learning [5,6,7,8]. Even today, they are in use by instructors for the United States Army [8], Navy [7], Air Force [5], and Department of Transportation [6].

2.1 Law of Readiness

The law of readiness states that a student learns best when they are mentally, physically, and emotionally ready to learn. It says that motivation is a pivotal part of

effective learning. "Quite simply, motivated students learn more than unmotivated students." [7] This law involves student interest and the perceived value of the material. Further, it says that too many distractions can significantly reduce learning and that a student that is involved in the learning process will learn the material better. It also says that the best learning happens in conjunction with good physical health (rest, food, and exercise).

2.2 Law of Exercise

The law of exercise is not about physical exercise, as its name implies. Instead, it has two components that relate to exercising a particular skill. The first is that learning is increased through practice and repetition. The second is that feedback is important. Specifically, this law emphasizes that practice and feedback must exist together for the best learning results.

2.3 Law of Effect

The law of effect looks at the emotional responses of the student. It states that a student will learn more when the learning is associated with positive emotions. You can think of it as the law of positive feelings. As an example, a student who has success with initial material will associate positive emotions to the learning experience and will be more motivated in subsequent steps. Further, student choice has an impact on positive feelings and motivation.

2.4 Law of Intensity

The law of intensity states that things which are more intense are more likely to promote learning. This law is why we learn more from an exciting lecturer than we do from a book. It is why real life experiences make the best teachers – they are the most intense. In a nutshell, intensity heightens our perceptions and brings our full concentration to bear on a task, which increases learning.

2.5 Law of Primacy

The law of primacy states that the first thing you learn makes the strongest impression. This law is why it is hard to replace flawed logic, unlearn bad habits, and fix negative training. This law is related to time.

2.6 Law of Recency

The law of recency says that learning degrades over time, so it is easier to remember the things we learned most recently. We can all remember material that was just discussed, but it is easy to forget a topic from last week or last month. This law is why instruction is designed to build upon prior material in a cyclical fashion and why we see significant declines in learning over inactive summer breaks [9]. This law is related to time.

2.7 Narrowing the Focus

These six principles are the laws of learning. When combined, they paint a picture of the basic conditions that are needed to improve learning. However, taken together, they cover an incredibly broad range of material, including everything from eating a good breakfast to the dynamism of the teacher to how often the student is physically exercising. While each of these laws is important, there is simply too much material to fit within the scope of this paper. Therefore, let's narrow the focus.

We will simplify this discussion by skipping over aspects that deal with the physical-world or with time-based conditions. After all, eating a good meal (physical) and what you learn first (time based) are important regardless of whether you are in a classroom or playing a game. Therefore, remove the laws of recency (time based) and primacy (time based) from consideration. Further, the law of readiness has physical aspects that can be eliminated, leaving only its motivational aspects.

This leaves only four laws and allows a closer look into some of the details. Specifically, let's independently examine the two components of the law of exercise: practice and feedback. Additionally, we will look at an idea that stretches across several of the laws: choice/involvement. We will call

these six focus areas the **laws of learning for games** (see Figure 1).

Figure 1 – Laws of Learning for Games

2.7.1 Motivation (from Readiness)

Motivation is a large part of the law of readiness and is strongly linked to learning in almost every way [5,10,11,12,13,14,15, 16]. Much research has focused on motivation and the results are very clear. A motivated student learns more, learns faster, and retains longer. Motivation is the holy grail of learning theory.

2.7.2 Feedback (from Exercise)

Feedback, like motivation, is strongly linked to learning [10,6] and is a crucial part of doing anything well [13,14]. Feedback can come in almost any form as long as it conveys your progression toward a goal.

2.7.3 Practice (from Exercise)

Time on task is a basic requirement of learning. Practice enables learning to occur and is a prerequisite of mastery. Research has shown that mastery requires 10,000 hours of practice [9]. It is important to note, as the National Research Council observes, "while time on task is necessary for learning, it is not sufficient." [10,p77]

2.7.4 Positive Feelings (aka Effect)

As expressed above, the law of effect can be thought of as the law of positive feelings. This paper will use that term. This idea simply states that learning is improved when associated with positive feelings/emotions.

2.7.5 Intensity

Intensity says that strong experiences will improve learning due to increased interest and heightened focus [7,8,5,17]. A dynamic speaker will hold your attention more than a dull one. Note that intensity is not limited to only positive experiences. Intense negative experiences can also be instructive, but are limited by the law of positive feelings.

2.7.6 Choice/Involvement (from Effect, Readiness, Intensity)

Learner choice and involvement are sub-parts of the laws of effect, readiness, and intensity [5,6]. Choice and involvement have long been shown to impact motivation [18], which is a part of readiness. From the law of intensity, we know that active involvement and choice are better than passive consumption. Finally, we know that being a part of the decision process that led up to the current material impacts both the feelings toward the learning (effect) and the motivation to learn (readiness) [18,11,12]. This sixth law puts all of this together into one idea in order to highlight its importance and enable comparison to elements of game design.

3.0 GAME DESIGN

Now that we have identified the six laws of learning for games, it is time to look at game design. Like learning, game design is a very large topic. There are hundreds of books and papers on the subject. In addition, game design is further complicated because the process of developing the game impacts the design [19]. A full exploration would require a discussion of many aspects of game development, including the art pipeline, level editors, working with programmers, developing in iterations, and play testing.

Fortunately, we're not interested in every aspect of game design. The goal of this paper is to build a bridge between game design and the laws of learning. Therefore, we can limit the discussion to the essential

aspects of game design that influence all games. This includes seven techniques: flow, feedback, simplicity, immersion and engagement, choice, practice, and fun.

3.1 FLOW

The first technique is **flow**. Flow is "the state in which people are so involved in an activity that nothing else seems to matter; the experience itself is so enjoyable that people will do it even at great cost, for the sheer sake of doing it." [13] It was first described by researcher Mihaly Csikszentmihalyi [13,14], but has since been expanded upon by numerous researchers including Seligman [20], Schwartz [21], Deci [11], and Pink [12]. Flow is often described as the optimal human experience and is sometimes referred to by the term 'engagement.' [20,11,12] It can occur with any activity and has been linked to a person's overall well-being [20].

Flow is widely accepted to be one of the fundamental reasons that people play games [13,17]. It is the essence of games. For game designers, the question is not whether flow is important, but, rather, how long you can keep your players in flow [22].

3.1.1 Requirements for Flow

There are four requirements for flow [13,14, 17]. Each is explained in relation to games.

1) Clear Tasks – Player understands what he is to do. Sometimes this means deriving his own goals.
2) Feedback – The game gives a lot of feedback about progression towards goals and whether the player's choices are working or not. The feedback is usually immediate.
3) Balanced, attainable goal – The tasks should be somewhat challenging, but also achievable and not overly long.
4) Concentration – The player must be able to concentrate on the game and the game should avoid distracting the player away from the tasks. This can happen with complex interfaces, intrusive story elements, or interruptions to gameplay.

3.1.2 Balance of Difficulty vs. Skill

Most of the requirements for flow are pretty straight forward. However, the third requirement is particularly complex and will require further explanation. In a nutshell, it says that a task must be simultaneously challenging and achievable. For games, this means that objectives must be challenging enough (and not overly long) or we become bored and lose interest. On the other hand, if the task is too hard, we become frustrated and anxious, and, once again, we lose interest and motivation. In addition, as we play the game, our skills will naturally improve and the challenges have to increase to match. When drawn out, this creates the **flow channel** (see Figure 2).

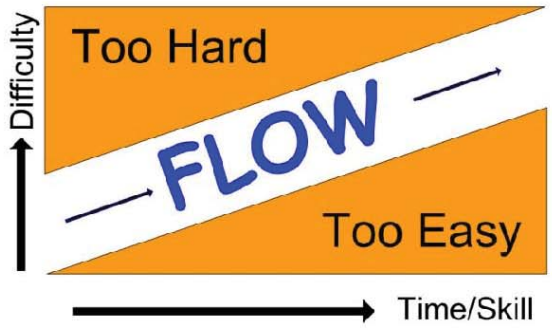

Figure 2 – Balance of Difficulty vs. Skill/Time

For games, balancing the flow channel is everything. It impacts motivation, learning, and enjoyment [18,13,14]. Since entertainment games are primarily for pleasure, a loss of player enjoyment or motivation is disastrous. Therefore, to keep players in flow as long as possible, the game industry has evolved an incredible array of techniques. Some of these include: chapter-based systems; dynamic difficulty adjustment; simplicity and transcendence; use of failure and repetition; eliminating the need for manuals; player adjustable difficulty; and expansive use of self-guided tutorials (both integrated and stand-alone) [3,17,23,24].

3.1.3 Link to Laws of Learning

By definition, flow is entirely about motivation [13,14], our first law of learning for games. Specifically, flow is about intrinsic motivation – the joy of doing [11,12]. When a player is in flow, he is completely focused on the task at hand, the tools and techniques available, and how he is progressing toward his goals. Given this level of intensity, it should come as no surprise that "the flow experience acts as a magnet for learning." [14,p33]

3.2 Feedback

Feedback is the second technique used by game designers. It is also the second aspect of our laws of learning for games as well as the second precondition of flow. In short, feedback is important.

Simply stated, feedback is how you perceive progress [13,14]. It tells you when to stop pouring milk in a glass and how hard to push the brakes in a car. The glass fills up and the car slows. The feedback enables us to correlate our actions to outcomes. Without feedback, it is extremely difficult to perform even simple tasks (e.g. pouring milk into an opaque container with a lid).

The same is true in games. In fact, games are particularly adept at using feedback [17]. Fundamentally, games operate on a feedback loop [25]. A **feedback loop** involves four stages: 1) measure behavior; 2) relay the measurement to the user; 3) realize some sort of outcome; and 4) provide opportunities for alternate action.

The feedback loop has been an essential part of game design since the very first games gave points for eating ghosts/pellets. It's hard to even imagine what a game like Pac-man™ would look like without feedback. Imagine if the pellets did not disappear when touched, but you still had to touch all the pellets one time to finish a level. Feedback is such a core part of game design that modern businesses are now using the feedback seen in games as a way to improve real-life through 'gamification.'

The use of feedback in games is fairly straight forward. But, at the same time, it can be applied in an almost infinite variety of ways. If you open any computer game ever invented, you might encounter typical feedback mechanisms such as: a scoring system; a way of tracking progress on goals (9 of 10 things); comparative statistics (high scores); an end-of-level debrief; growth indicators (50% through a cooking skill); and death/failure outcomes. Each of these gives feedback about your progression, performance, or skill growth. They show the outcomes your actions.

One final note about feedback in games is that it can generally be grouped into two categories: short-term and holistic. Short-term feedback is an immediate measure of how you are doing. For example, you hit something for 12 points of damage or you sold a gem worth $50. Holistic feedback relates to the larger progression within a game. It has more meaning and weight. For example, maybe you unlocked a new dungeon area to match your increasing power or your character in the Sims™ got older. Holistic does not necessarily mean there is a delay between the action and feedback. It might still appear immediately, but it has more meaning than just +1 pellet.

3.2.1 Link to Laws of Learning

By definition, feedback is our second law of learning for games. In addition, feedback is a requirement for flow, which links it to motivation and makes it a critical consideration for game designers.

3.3 Simplicity

Simplicity is another core aspect of game design. Simplicity in games means that "everything should be made as simple as possible, but not simpler." [27] The idea is not particularly new or even unique to games, but game designers consider it to be an essential, guiding philosophy. Consider this quote, attributed to Will Wright, designer of the Sims™, "Your garden is not complete until there's nothing else you can remove." [28]

Games simplify the world down to "goals and rules of action" [14,p29] and allow players to focus entirely on "what should be done, and how." [14,p29] This makes it easier for players to achieve flow, which increases motivation, and can lead to improved learning. For game designers, simplicity is not just an idea. It is a practical consideration that applies to all aspects of game design including the user interface, the goals of the game, feedback loops, game mechanics, user input, screen layout, story narrative, and the rules and instructions.

Another way to think about simplicity is the idea of **transcendence**. This means that "the player is more powerful in the game world than they are in the real world." [17] At first, transcendence might seem to apply only to magical or fantastical settings. However, games, especially learning games, can be about anything in any setting. Even with mundane tasks and real world ideas, games offer transcendence. They simplify an experience and allow players to complete tasks faster than real life, with fewer obstacles, with less outside assistance, and in highly unlikely situations.

3.3.1 Link to Laws of Learning

By definition, simplifying means to reduce complexity. In games, this means reducing the number of steps, abstracting the process, limiting options, and reducing the cognitive load. By narrowing the set of goals and actions, a game makes goals easier to understand and helps players to correlate the feedback to their actions. In addition, games strive to present new material in its simplest form, which helps to balance difficulty versus skill. Finally, a simple user interface helps reduce distractions by minimizing extraneous information. All totaled, the simplicity offered by games has a direct impact on feedback and flow, which link to positive feelings and motivation.

3.4 Immersion and Engagement

The fourth technique comes from Douglas and Hargadon. They explained that there is a difference between immersion and engagement [29]. **Immersion** is when you become deeply interested in a story or narrative. Immersion is usually a passive activity and can be associated with the idea of presence [30]. **Engagement**, on the other hand, is when you are actively involved in trying to work through a problem or puzzle.

As an example of immersion, consider watching a movie or cut-scene. As an example of engagement, consider playing a gripping online death-match or extinguishing a fire in the DCT. Though immersion and engagement overlap at times, the difference is that one is passive and the other is active. If you are immersed in a passive activity and it morphs into a problem you are actively trying to figure out, then you have become engaged instead.

The important point is that games often use both. They use a combination of story, attractive graphics, animations, particles, and other visual and audio techniques to immerse you passively in the virtual world [17]. At the same time, they engage your brain with a series of puzzles, choices, and problems that you must solve as part of the game experience. By combining these two, games can create very intense experiences.

3.4.1 Link to Laws of Learning

Not all games use immersion and engagement in the same way, but most of them use some combination of both. It leads to the powerful and compelling experiences that make games popular. In other words, games use the law of intensity.

3.5 Choice/Involvement

Games are the embodiment of **choice** and **involvement**. Sid Meier is often quoted as saying, "games are just a series of interesting and meaningful choices." [31] Schell observes that not only must games provide choice, but the choices must be meaningful [17]. Not much else really needs to be said about how important player involvement and choice are to games.

Clearly, it is important, and clearly, games offer countless ways to do it.

However, there are other aspects of choice to explore. First, there is extensive evidence that choice and autonomy are associated with positive feelings and play a significant role in a person's overall health and well-being [11,12,21,20]. Second, despite all of the good that comes with choice, it has a dark side too: the paradox of choice [21].

The **paradox of choice** is that some choice is good, but too much choice can be very bad [21]. When faced with too many choices, people have difficulty weighing all of the factors involved. This leads to three possible outcomes: 1) we simplify the decision with increasingly arbitrary criteria; 2) we hit option paralysis (inability to decide); or 3) we postpone decisions. In games and in life, this is bad for several reasons:

- Too many options make a decision very complex, which increases the difficulty of the task. This impacts motivation and makes it harder to maintain flow.
- People are not good at comparing a lot of options. So, we simplify the criteria. In the extreme, the simplified criteria become almost random. This makes it hard to correlate actions to outcomes.
- We experience regret and buyer's remorse, which distracts us from the task and breaks flow.

Although this line of research is relatively new, game designers have long been aware of the need for simplicity (section 3.3) and thus, the need to limit decisions [17,24].

3.5.1 Link to Laws of Learning

The one idea of choice and involvement originates from three separate laws of learning: readiness, intensity, and effect. This idea means that people are more motivated, have more intense experiences, and have more positive feelings towards activities where they have choice, involvement, and control. By definition, a game is not a game without these things. This ties game design to the sixth law of learning for games.

3.6 Practice

The sixth technique is **practice**. Games make extensive use of practice and **repetition** as a part of normal game play to help promote mastery [17,24]. Games generally require you to master a set of skills by overcoming a series of challenges that increase in difficulty and variety over time. New skills or techniques are added into the mix until you have mastered everything there is to learn and the game ends. As Koster points out, a good game is "one that teaches everything it has to offer before the player stops playing." [24,p46]

A common technique used in games is the idea of treadmills (aka. 'grinding') [32]. This is practicing the same basic sets of skills in order to level-up or improve her virtual character attributes. Usually, treadmills offer very slight changes in the environment or activity plus feedback such as experience or levels. Like a real treadmill, she is running in place with the tacit understanding that she is improving her skills.

In the Navy's DCT, repetition is used to strongly reinforce the importance of closing hatches once a Navy vessel is underway. The game teaches the player to close a variety of doors in a variety of situations. The lesson is practiced repeatedly and these skills transfer to the Battle Stations 21 graduation exercise [2].

Consider two final notes about repetition. The first is the possibility of emergent gameplay. This is when you have simple mechanics that combine in complex ways to create an incredible range of learning possibilities [24]. Emergent gameplay takes the idea of practice to a whole new level by opening up the ideas being explored within the game. The Sims™, League of Legends™, and Minecraft™ are great examples of emergent gameplay.

The second note about repetition has to do with the penny problem [33]. Games

sometimes use repetition in place of new content, as is seen in games like Tetris™ or Bejeweled™. In this case, you can end up with extensive exposure to material without real learning. The classic example is the inability to describe what's on a penny, despite having seen thousands of them [33]. This is an example where the techniques used in games may not improve learning.

3.6.1 Link to Laws of Learning

Games use practice and repetition in many of the same ways as traditional learning. Practice in games helps players achieve mastery of mechanics and helps players overcome increasingly difficult challenges in the flow channel. It is a direct application of the third law of learning for games.

3.7 Fun

The last technique is **fun**. It doesn't seem like a paper on game design would be complete without a discussion of fun. But what is 'fun'? It is pretty nebulous. It is used in lots of ways and means different things to different people, even to game designers.

Raph Koster says that 'fun is really just another word for learning.' [24,p46] He says that we play games because we enjoy finding, applying, and mastering patterns. Lazzaro, on the other hand, says there are four categories of fun: easy fun, hard fun, serious fun, and social fun [34]. Chris Crawford says that "fun is the emotional response to learning." [24,p229] Schell concludes that 'fun is pleasure with surprises.' [17,p37] These definitions have similarities but are each quite different.

However, there is one point all these designers agree upon: fun is an essential part of game design. It is a core consideration and a requirement for games. However you define it, regardless of how you achieve it, you must have it.

So, that still leaves us without a useful definition for fun as it relates to games. To solve this, we will define our own. Borrowing from the definitions of fun by Schell [17], Koster [24], Lazzaro [34], Crawford [24], and Csikszentmihalyi [13,14,12], we can create the following definition:

> *Fun is the positive feelings that occur before, during, and after a compelling flow experience.*

It is not perfect, but it is concrete. Plus, it links well to the ideas presented by Koster, Lazarro, Schell, Crawford, and Csikszentmihalyi. The list of positive feelings associated with this definition of fun is quite long and includes: delight, engagement, enjoyment, cheer, pleasure, entertainment, satisfaction, happiness, fiero (triumph), control, and mastery of material. Best of all, it links the fun we experience in games to the idea of positive feelings associated with learning.

3.7.1 Link to Laws of Learning

Regardless of how you define it, fun links games directly to the law of positive feelings. In fact, most of the game design techniques described in this paper can be linked to positive emotions. Flow creates feelings such as engagement, satisfaction, and pleasure [13,14]. Immersion and engagement are both positive feelings, almost by definition [29]. Practice leads to mastery, which is linked not only to positive feelings, but also to overall health and well-being [20]. Choice and involvement are critical aspects of humanity and are an essential requirement for happiness [21].

4.0 TYING IT ALL TOGETHER

Section 2 introduced the laws of learning. These six laws describe the basic tenets that are known to improve learning. From that list, we eliminated the areas that were based on the physical conditions of the student (e.g., being healthy) and the time associated with the lesson (e.g., what is learned first). That left us with the six laws of learning for games.

Section 3 described seven critical techniques used by game designers. These include flow, feedback, simplicity, immersion

and engagement, choice/involvement, practice, and fun. Each of these aspects is important and ties game design to the laws of learning. In Table 3, we combine and compare the two sets of ideas, side by side.

Law of Learning	Idea	Game Design Techniques
Motivation (Law of Readiness)	Motivated students learn more	*Flow* is the fundamental attraction of games. Games are *fun* and require moment-by-moment *choices*. This leads to extremely motivating experiences.
Feedback (Law of Exercise)	Feedback is how learners correlate actions with outcomes	*Feedback* is an essential part of games and a requirement for *flow*. The *simplicity* of games helps the learner correlate actions to outcomes.
Practice (Law of Exercise)	Practice is necessary for learning and mastery	Games use *practice* to promote mastery. They use increasing difficulty to keep players in *flow* and promote the learning of virtual or real skills needed to progress.
Positive Feelings (Law of Effect)	Learning is increased when associated with positive feelings	Games are supposed to be *fun* - defined as the positive feelings associated with compelling flow experiences. The *simplicity* and *involvement* of games encourages feelings of accomplishment and mastery.
Intensity (Law of Intensity)	Intense experiences increase learning, interest, and retention	A person in *flow* is intensely focused on an activity. The *feedback* loop intensifies the relationship between action and outcome. Games use a combination of *immersion and engagement* to create intense experiences.
Choice/Involvement (Laws of Intensity, Readiness, Effect)	Involvement and decision making can increase motivation, intensity, and positive feelings	Games *simplify* the world to a series of interesting and meaningful *decisions*. From moment to moment, players are actively engaged in the process of learning through experience.

Table 3 – 'Laws of Learning For Games' Linked to 'Game Design'

Once the two sets are laid out like this, there can be no mistaking the strong synergy between them. In fact, one thing becomes extremely clear. Many of the principles that are critical for effective learning are also a fundamental part of games. Conversely, many of the techniques that make games appealing are also a part of what is needed to improve learning.

5.0 CONCLUSION

Certainly, this paper is not a comprehensive exploration of this topic. The science of learning is advancing quite rapidly and the laws of learning are just the beginning of what we know about how people learn. In addition, motivation and well-being have only recently become a major topic of focused research.

The same is also true of games. The art and science of game design is a complex subject that has only been briefly explored in this paper and, just as with learning, is rapidly evolving. The game industry is exploding into a new world of social and mobile games and the gamification movement is attempting to blur the lines between games and our day-to-day lives.

There is much we still have to uncover about the science of both learning and game design. However, this paper has laid out some concrete, fundamental similarities that lead to the following conclusions.

First, game designers need to take a closer look at the science of learning. If a core part of games is learning, then game designers would do well to learn more about how people learn. If games work because of motivation, practice, and intensity, then designers should spend time learning what motivates us, why we practice, and the basics of human psychology.

Second, instructional designers need to take a closer look at games. If games can create significant improvement in performance, then learning designers would

do well to figure out why. If games work because of flow, simplicity, choice, engagement, and fun, then instructional designers should spend some time learning how to encourage flow, how to leverage simplicity, what makes an activity engaging, and how to foster fun.

The parallels are too strong for either discipline to ignore. Perhaps by studying games, we will advance the science of learning. And, perhaps by studying learning, we will learn to build better games. The one thing that is clear is that there needn't be a gap between the two professions. Game design and instructional design are fundamentally just two ways of looking at the same problem. Perhaps, the place to start is a bit of change in each of us – a change in perspective.

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