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Embrace the unexpected: Yet another family conversation

Elizabeth Tipton
Eastern Washington University, USA

James Murff
ArenaNet, USA

Abstract *This paper summarizes a long conversation between an educational game design mother and her entertainment game tester son that began with a discussion about bugs in video games. Along the way, it led to some interesting observations on emergent behavior and metagaming. Finally, this dialog wandered into experiences with emergent gameplay in the design and implementation of pedagogical simulations and games. The importance of good debriefing in the classroom was also underscored.*

Keywords*: bugs; debriefing; designer-player interaction; emergent behavior, intentional emergent gameplay, metagaming, player agency Introduction: Working definitions of Gaming Simulation*

Four years ago, the authors made public during panel discussions at ABSEL and ISAGA their conversation on improving educational game design through an understanding of the problems commonly seen in during the testing and consumption of entertainment games. Those dialogues have continued to this day. What follows began over dinner one day when the topic was bugs in video games.

Bugs

Bugs, harmless or otherwise, are a common part of software development. You can't predict every single outcome of a particular scenario, especially when the system is extremely complex. While test cases and extensive QA can help, games always ship with glitches ranging from the hilarious-but-harmless to the game-breaking.

Some games ship with so many bugs that they are unplayable, but thoroughly entertaining to watch from the perspective of a horrible disaster playing out. The main objective as stated on the box of BIG RIGS: OVER THE ROAD RACING (2003) was to race a semi to safety in order to deliver illegal cargo while avoiding the police. Yet in the game itself, there are no police and no load is attached to the truck. Glitches caused by abnormal physics, no collision detection, level geometry failing to load, win conditions that don't exist, non-existent AIs resulting in opponents that never move, and debug text visible to the player just added to the unplayability. RIDE TO HELL: RETRIBUTION (2013), originally planned as an open-world game to be released in 2009, was heavily revised to lose the open-world elements, split into three linear games, and released in 2013. Along with design choices that are offensive at best, this game suffers from glitches so severe that the only positive remark in Electronic Gaming Monthly was about the pause menu (Harmon, 2013).

Although bugs are a common feature of games that allow for open player interaction, they do not necessarily lead to failure as a game. Consider the action role-playing video game THE ELDER SCROLLS V: SKYRIM (2011). This game is known primarily for two things: an open world that you can explore at your own discretion, and its hundreds of glitches. For example, items on a table can remain in place as they should, they can become invisible while remaining in their original position, or they can slowly rise and float at a small height above the table. NPCs (computer controlled characters) can get stuck into the same routine over and over again, or their animations might glitch out in strange ways. A king can just sit in midair like he is on his throne. Rabbits have been spotted hopping around underwater. Fish have chased players out of a pond and across land for long distances. Dragons - one of the

most fearsome enemies in the game – have been known to fly backwards, to fart fire, to play their sound tracks backwards, to lose their skin mid-battle and continue fighting onward as skeletons, and to even die suddenly from landing on a tree or from meeting a mudcrab or for no discernable reason at all in mid-air. Bethesda, the game's developer even stated before the game was released that certain bugs would be kept for their entertainment value.

RED DEAD REDEMPTION (2010), a western-themed open-world action game, also has numerous glitches. Shortly after release, many players reported key elements becoming invisible when in multiplayer mode. While this was promptly patched, other bugs have been immortalized online and have even become memes. Photos of NPCs floating in mid-air and being partially entrapped within boulders have been posted. Videos of AIs being misassigned to the wrong NPCs can be seen on YouTube. These include the gunslinger-dog, the bird-people, and the cougar-man glitches. The most famous is the donkey-lady: a woman with the programmed behavior of a donkey and the physical model of a normal person.

MINECRAFT (2011), a sandbox game riddled with funny glitches, took advantage of one by repurposing it. The NPC known as the creeper began as a failed model for a pig. It has since been merchandised as the game mascot in stuffed toys, action figures, LEGO and apparel. It has even made appearances in TV shows, music concerts, and games produced by other companies.

Emergent behavior

When it comes to emergent behavior in software though, it gets more complicated. Emergent behavior is when specific components of a game behave as they are supposed to, but they either go too far with their behaviors or interact in ways the developer didn't originally intend. These are separated from bugs in that they are often not obvious as to their source or they do not break player immersion; rather, they are the result of the system elements interacting in a way that the developer didn't predict.

Perhaps some of the funniest examples of emergent behavior come from the testing of the Radiant A.I. system developed by Bethesda for THE ELDER SCROLLS IV: OBLIVION (2006) and then expanded for use in SKYRIM. This AI system is intended to give life to an open world role-playing game by allowing NPCs to interact

with the game world through the establishment of goals without specific scripts for each character on how to achieve these goals. This allowed for a much larger game world with a more organic feel, but in its original incarnation this system caused NPCs to satisfy their programmed needs in strange ways. During one test for OBLIVION, an NPC given a rake with the goal of sweeping the porch murdered another NPC that had a broom in order to obtain the proper item to complete the goal. In another test, an on-duty NPC guard became hungry and went into the forest to find food. The other NPC guard went after him to arrest him for being AWOL. The NPC villagers then looted the unprotected town as law enforcement was missing. Bethesda has worked hard to solve these issues, but new ones still crop up from time to time. During the testing for SKYRIM, players committing crimes would get caught even though they appeared to be unseen by other characters. It took quite a while to discover that the crimes were being reported to the NPC guards by the NPC chickens.

Emergent behavior is by no means restricted to AIs, though. CRACKDOWN (2007), an open-world third-person shooter game, had an emergent behavior accepted as part of the game. As you level up your driving skill in this game, it makes specific cars you drive stronger; one car type in particular gained traction and suspension with each driving level attained. Thus, when the maximum level was reached, the car's traction was strong enough to grip the side of a vertical surface, allowing the player to drive up the sides of buildings. Rather than changing the emergent behavior with this came to light, the developers embraced this as part of the gameplay. The most ubiquitous examples of an oversight in game engine code creating emergent behaviors are from id Software's DOOM (1993) and QUAKE (1996). Several now-common first-person shooter mechanics originated as oversights in these games' engine codes: Straferunning, bunny-hopping, and rocket-jumping. Straferunning occurred in the DOOM engine and involved holding down the move forward and strafe keys simultaneously to move quicker – a common behavior seen among those who are seeking to speedrun the game. Bunny-hopping arose from the QUAKE engine by jumping as soon as the player's avatar touches the ground and holding the strafe button at the same time. This particular combination resulted in a dramatic increase to a player's speed. As the QUAKE engine pushes

back characters when rockets explode, players discovered that by firing rockets at their feet when jumping, they could jump significantly higher. Noticing these behaviors, id Software began designing maps with secrets accessible only through rocket jumping. Designers working on games like TEAM FORTRESS 2 (2007) have now specifically included rocket jumping as an option to provide heavier characters with greater mobility on the field. All three of these skills have been embraced by both designers and players as a beloved part of shooter game design; these initial oversights have led to greater depth in player agency.

Designer-player interaction

The embracing of emergent behavior in games is important because it often stems from the designer-player interaction, specifically where designer intent intersects with player agency. Designer intent is how the designer intends for the game to be played and for the game systems to interact; player agency is how the player approaches the choices given to them by the designer. When an engine glitch or design oversight gives a player an unexpected choice that leads to a unpredicted scenario, emergent game behavior happens.

One of the most important features in fighting games - the combo system - is a result of emergent game behavior. In the original design for STREET FIGHTER II (1991), there was no combo system. However, a glitch in the programming allowed for players to “cancel” moves (skip the recovery time) by performing another move within a specific time window. Though entirely unintentional, this canceling mechanism allowed players to string together combos of moves to deal more damage to opponents. This unintended option discovered by players was allowed to remain. Other designers then incorporated it as a designed element of their games.

This principle of "players will do anything they can figure out to win" also extends to more traditional, non-multiplayer gaming structures. The first-person puzzle-platform video game PORTAL (2007), for example, has a situation that requires solving several smaller puzzles in order to complete a bigger puzzle. However, Valve found that experienced players were skipping the main puzzle entirely by using the portals to fling themselves in an interesting

way. Instead of taking a few minutes to solve the puzzle, players managed to solve it in seconds. Instead of designing this possibility out the game, Valve left it in, allowing players with a greater grasp of the game the ability to showcase their prowess.

Market manipulation in an open economy is one of the defining features designed into EVE ONLINE (2003). When given the avenue to control both supply and demand of a good, players game the market to earn more money. This manifests itself through interdictions, stockpile hoarding, trade embargos, and even a profession - the lowly "station trader," someone who uses their ample stockpiles of cash to corner markets and make a tidy profit without ever leaving the safety of a station. With all of this going on, the game designers specifically did not include a financial law game mechanism. Yet, a group of players held the first in a series of in-game IPOs for a dividend based on profitability in 2005.

Intentional emergent gameplay

The running theme here is that emergent behavior, whether it stems from glitches or unexpected player interaction, makes the player feel as though they have "discovered something." You can't always rely on emergent behavior to occur, though; many developers attempt to kickstart the process with their own design choices, to varying effect. Even if it's designed specifically so that players try out a particular behavior, the act of giving them that choice reinforces their belief that the game allows for true interaction. This is the principle of using player agency to inform new design.

The most profitable series in gaming history, GRAND THEFT AUTO (1997), is based on the concept of making the player feel as though they have discovered something clever or outside the bounds of the game, when the designer purposefully allowed for the behavior. When the designers noticed players were running over pedestrians and crashing cars more than actually racing when placed in an open-world environment, they designed this game to cater to the players' desires for destruction. "Rampage" missions - where players are given the goal to cause as much destruction as possible within the game world - are among the most played and beloved missions in this series, and for good reason: They are emergent player behaviors given designed form.

DISHONORED (2012) and DEUS EX (2000) are among the best examples of intentional emergent gameplay in video games. Both games are open-world action games where player choice determines the path through the game. However, they tend towards non-linear solutions to problems. DEUS EX combined first-person shooter, stealth, and role-playing elements in one game. It won critical praise for its pioneering design in player choice and multiple narratives as most situations had several possible solutions for completing the objectives. In DISHONORED, you play an assassin out to punish those that framed you for regicide. The levels are designed so that the player can approach the problem of taking out a target in a variety of ways. Rather than force the player into a specific action to achieve the in-game objectives, the developers designed these games to give the illusion of greater player agency.

Intentional emergent behavior is not restricted to the previously mentioned game genres. THE INCREDIBLE MACHINE (1992), based on the concept of Rube Goldberg devices, provided a set of objects governed by the rules of physics with which the player solved puzzles. Completion of the puzzle objective determined success, not the actual details of the solution. Intentional emergent behavior is not even restricted to computer games as the very first modern table-top role playing game, DUNGEONS & DRAGONS (1974), was designed in a manner that encouraged these behaviors. This game system was both complex and ambiguous, resulting in groups of players developing their own house rules and styles of gameplay along with their own narratives. Intentional emergent behavior is not even a new idea; H.G. Well's encouraged such in the last chapter of his book on war gaming for children, Little Wars (1913), in the chapter entitled "Ending with a sort of challenge."

Emergent gameplay in the classroom

Peter Molyneux, designer of many iconic games including the first god-game POPULOUS (1989) and the construction/management simulation THEME PARK (1994), sums this up best in an interview from 2005. At that time, he indicated that players of the next-generation of games would "want to customize the experience, setting their own goals in a world that they can play around in" (Kosak, 2005). The students that we are

designing for now have grown up in this environment of games encouraging emergent behavior. This is particularly evident in a recent study of undergraduate students and information technology (Dahlstrom, 2012), where 55% of the students "wished instructors used more simulations and educational games."

At ISAGA Summerschool 2012, a team learning educational game design developed "The Bunny Festival." In this experiential exercise, the specifications for the product to be manufactured were given via an instruction sheet. These appeared to be rigid steps; yet when read carefully, it is apparent that no steps were actually given. When the designers realized that their project encouraged emergent gameplay, the game was altered to run for two production rounds with a mid-game debriefing to encourage those that had not done so already to "think outside the box." During testing and in classroom use so far, players have found unique unanticipated ways to satisfy each of the specifications and some have even defined new goals for themselves that go beyond the stated goal of the game.

As educators, we are most familiar with environments where conditions are completely predictable as this centuries-old model has allowed us to convey an extensive amount of information in a relatively simple manner. While problems with this have been long noted (Dewey, 1916), it is particularly incongruent for students who have been raised with games encouraging emergent behavior. The only true way to harness emergent design is to watch how students approach a particular game. When the players break a game in a new or interesting way, the instructor/facilitator has an option: force the students back into the designed learning outcome by shutting down the method used to break the game, or embrace the experience and possibly use it to teach a different lesson.

Hofstede & Murff (2011) reported on an experience where an old well-tested game, SO LONG SUCKER (Shapely et al., 1964), demonstrated emergent behavior when used in a multicultural classroom. Based on prior experience with this game, it was expected that the students would recognize that potentially unethical behavior was inherent in the game structure, and not due to personalities. In order to win, a player would have to form a coalition and then break it. This was not the result, however, when the class was composed of students in equal parts from the USA and Taiwan.

Students were presented with the rules one week in advance to allow time to plan strategies. During the classroom session, several rounds of the game were played. When a round consisted of only American students, minimal negotiation occurred in an aggressively played game. Cooperation existed only in the short term, long enough to eliminate a specific player. In later rounds, double-crossed players readily formed coalitions with those who had previously betrayed them. When a round consisted of only Taiwanese students, extensive negotiation in a hesitantly played game happened. These players persisted in finding a team solution, even when it was readily apparent that such was not possible. Double-crossed players refused to cooperate with their betrayers in later games. When a round consisted of players from both groups, a new behavior emerged among the Americans. Initially, the Taiwanese quickly formed coalitions to eliminate the Americans. After a few repetitions of this, the Americans adapted their strategies, more quickly forming longer-lasting coalitions. The impact of this was not noted until the debriefing, when the distinct emotional and behavioral responses really came to light. The students were quite upset.

The planned debriefing questions were abandoned and the potential chaos was embraced by the instructor. With the students asking each other many probing questions, it was discovered that the Taiwanese were much more upset by the game than the Americans. The Taiwanese students had prepared extensively prior to the game session; the Americans were not so well prepared. The Taiwanese were frustrated as the Americans would not participate in the search for a cooperative solution. The Americans were frustrated as the Taiwanese did not seem to realize this was just a game. As the discussion continued, the students recognized the cultural sources for their behaviors during the game play and then extended this to their behavior during the debriefing and beyond. This emergent behavior resulted in a multicultural group of students that identified with each other to work at a level not previously seen in this student population, at least through graduation. If the original planned debriefing had been followed, this unanticipated yet far-reaching lesson would have been lost.

Meta-emergent behavior

When players create their own collaborative systems to interact with a game's inherent systems, a new form of emergent behavior arises: meta-emergent behavior. Speed running, in which players compete to complete the game in the shortest amount of time even if the game is not normally timed, has been around at least since the release of the LEGEND OF ZELDA (1986). Using violent games creatively rather than destructively spawned games like MINECRAFT. Players may create real world objects like the Turing-complete calculator powered by dwarves built within the DWARF FORTRESS (2006) game reported in 2008. Successor games, in which a player plays a one-player game for a while and then hands it off to another player, have resulted in tales such as the one from DWARF FORTRESS in 2006 where belligerent dwarf-eating elephants died in a biblical-level flood of lava. Collaborative data collection, in which players band together to gather data, share information, and theory-craft outside the game's confines, has been seen in relation to WORLD OF WARCRAFT (2004) and DARK SOULS (2011). Meta-emergent behavior is a bit easier to predict than standard emergence, as it simply takes existing game systems and creates a real-world challenge incorporating them.

This behavior can also occur in the classroom.. When SO LONG SUCKER was used in a Swiss-system tournament about a year after the incident reported in the previous section, it became apparent about half-way through that four students were actually playing to lose, but only some of the time. During the debriefing, it came to light that these students were curious to see if what they had learned about negotiations and strategy in another course could be implemented to attain a goal they had determined for themselves: Manipulating the tournament scoring so that only they would be in the finale together. By allowing the students to push the game system in an unplanned direction, these students converted theory into experience and experience into learning.

A final thought

By embracing the unexpected, we can encourage curiosity and promote emergent behavior within the game systems and

simulations we design and use. Always remember, "most learning is not the result of instruction. It is rather the result of unhampered participation in a meaningful setting." (Illich, 1972)

References

BIG RIGS: OVER THE ROAD RACING. Stellar Stone, LLC. (2003). Santa Monica, CA: Stellar Stone. (http://en.wikipedia.org/wiki/Stellar_Stone)

CRACKDOWN. Realtime Worlds. (2007). Redmond, WA: Microsoft Game Studios. (http://www.microsoft.com/games/)

Dahlstrom, E. (2012). *ECAR Study of Undergraduate Students and Information Technology, 2012.* Louisville, CO: Educause Center for Applied Research.

DARK SOULS. From Software. (2011). Tokyo: Namco Bandai Games. (http://www.bandainamcogames.co.jp/english/)

DEUS EX. Ion Storm. (2000). London: Eidos Interactive. (http://en.wikipedia.org/wiki/Eidos_Interactive)

Dewey, J. (1916). *Democracy and Education*. New York, NY: Macmillan Company.

DISHONORED. Arkane Studios. (2012). Rockville, MD: Bethesda Softworks LLC. (http://bethsoft.com/)

DOOM. id Software. (1993). New York, NY: GT Interactive. (http://en.wikipedia.org/wiki/GT_Interactive)

DUNGEONS & DRAGONS . Gary Gygax & Dave Arneson. (1974) . Lake Geneva, WI: Tactical Studies Rules. (http://en.wikipedia.org/wiki/TSR,_Inc.)

EVE ONLINE. CCP Games. (2003). Reykjavik: CCP hf. (http://www.ccpgames.com/en/home)

GRAND THEFT AUTO. Rockstar North. (1997). New York, NY: Rockstar Games. (http://www.rockstargames.com/)

Harmon, J. (27 Jun 2013). EGM Review: Ride to Hell: Retribution. *Electronic Gaming Monthly*. Lombard, IL: EGM Digital Media, LLC. Retrieved from http://www.egmnow.com/articles/reviews/egm-review-ride-to-hell-retribution/

Hofstede, G.J. & Murff, E.J.T. (2011). Repurposing an Old Game for an International World. *Simulation & Gaming* 43:1, 34-50.

Illich, I. (1972). *Deschooling Society.* New York: Harper & Row.

Kosak, D. (10 Mar 2005). Peter Molyneux on Next-Generation Game Design. *Gamespy.* San Francisco, CA: IGN Entertainment. Retrieved from http://www.gamespy.com/articles/594/594887p1.html

LEGEND OF ZELDA. Nintendo EAD. (1986). Kyoto: Nintendo Co., Ltd. (http://www.nintendo.com/)

MINECRAFT. Mojang AB. (2011). Stockholm: Mojang AB. (https://mojang.com/)

POPULOUS. Bullfrog. (1989). Redwood City, CA: Electronic Arts. (http://www.ea.com/)

PORTAL. Valve Corporation. (2007). Kirkland, WA: Valve Corporation. (http://www.valvesoftware.com/)

QUAKE. id Software. (1996). New York, NY: GT Interactive. (http://en.wikipedia.org/wiki/GT_Interactive)

RED DEAD REDEMPTION. Rockstar San Diego. (2010). New York, NY: Rockstar Games. (http://www.rockstargames.com/)

RIDE TO HELL: RETRIBUTION. Eutechnyx. (2013). Bavaria: Deep Silver. (http://www.deepsilver.com/home/)

Shapley, L. S., Nash, J. F., Hausner, M. & Shubik, M. (1964). 'So Long Sucker,' A four-person game. *Game Theory and Related Approaches to Social Behavior (M. Shubik, ed.)*. New York: John Wiley & Sons, Inc.

SLAVES TO ARMOK: GOD OF BLOOD CHAPTER II: DWARF FORTRESS. Tarn Adams. (2006). Unknown: Bay 12 Games. (http://www.bay12games.com/dwarves/)

STREET FIGHTER II. Capcom. (1991). Osaka: Capcom. (http://www.capcom.com/)

TEAM FORTRESS 2. Valve Corporation. (2007). Kirkland, WA: Valve Corporation. (http://www.valvesoftware.com/)

THE ELDER SCROLLS IV: OBLIVION. Bethesda Game Studios. (2006). Rockville, MD: Bethesda Softworks LLC. (http://bethsoft.com/)

The Elder Scrolls V: Skyrim. Bethesda Game Studios. (2011). Rockville, MD: Bethesda Softworks LLC. (http://bethsoft.com/)

THE INCREDIBLE MACHINE. Kevin Ryan. (1992). Eugene, OR: Dynamix, Inc. (http://en.wikipedia.org/wiki/Dynamix)

THEME PARK. Bullfrog. (1994). Redwood City, CA: Electronic Arts. (http://www.ea.com/)

Wells, H.G. (1913). *Little Wars; a game for boys from twelve years of age to one hundred and fifty and for that more intelligent sort of girl who likes boys' games and books.* London: F. Palmer.

WORLD OF WARCRAFT. Blizzard Entertainment. (2004). Irvine, CA: Blizzard Entertainment. (http://us.blizzard.com/en-us/)

About the author

Elizabeth Tipton PhD is Professor of Decision Sciences at Eastern Washington University. She has two bachelors (majors in mathematics and physics) and one doctorate (major in business statistics, minors in management science and marketing) from schools in Texas. After a several-year accidental diversion into administrative roles at her university and for the International Simulation and Gaming Association (ISAGA), she has recently returned full time to the classroom. When not talking about data visualization and analytics, she is talking about the importance of good design and debriefing in games and simulations for learning complex concepts. Contact: Department of Accounting and Information Systems, Eastern Washington University, 668 North Riverpoint Blvd, Suite A, Spokane, WA, 99202, USA; telephone +1 (509) 828-1215; etipton@ewu.edu.

James Murff is a game critic and developer from Seattle, Washington. His work has been published in notable gaming publications such as ZAM, Unwinnable, and Gamefront, and he works as a QA embed at ArenaNet, developers of the Guild Wars series. Most of his long-form critiques can be read at Simplikation.com. He will talk your ear off if you get him started on the topics of the critical and creative side of video game development, as his mother can attest. Contact: 2321 4th Avenue, Apt 306, Seattle, WA, 98121, USA; telephone +1 (509) 869-7589; dragonmaw@gmail.com.