Well Played

a journal on video games, value and meaning

Connected Learning Summit 2018 Special Issue

Edited by Drew Davidson

Carnegie
Mellon
University
ETC Press

WELL PLAYED

A Journal on Video Games, Values, and Meaning
Connected Learning Summit Special Issue

EDITED BY DREW DAVIDSON

CONTENTS

THE LOGICAL JOURNEY OF REIMAGINING "ZOOMBINIS"

Adventure, Research, and Computational Thinking

DR. JODI ASBELL-CLARKE, DAVID LIBBY, SARAH DITKOFF, PETER STIDWILL, & SCOT OSTERWEIL

ABSTRACT

TERC, FableVision Studios, and the Learning Games Network have redeveloped and re-released the popular game from the 1990s, The Logical Journey of the Zoombinis. The 2015 version, called Zoombinis, was redeveloped for mobile, desktop, and WebGL platforms. The relaunch was aided by a longstanding and devoted fan base, which enabled a successful Kickstarter campaign to help support the re-launch. In addition, the re-release of the game triggered research interest about how Zoombinis supports the development of Computational Thinking (CT) in upper elementary and middle school learners. Many of the skills players use to solve the logic puzzles in Zoombinis require CT practices such as Problem Decomposition, Pattern Recognition, Abstraction, and Algorithm Design. To study the development of CT in Zoombinis, The Educational Gaming Environments group (EdGE) at TERC conducted a nationwide implementation study with over 30 classes of learners in grades 3-8. This research uses Educational Data Mining to design and validate automated assessments of CT that use the data logs generated through Zoombinis gameplay. This allowed a study of CT skills that

players demonstrate implicitly during their puzzle solving. Thus far the research study has found that 1) teachers highly value activities that help them connect CT in the game to their math, science, and other class content, 2) teachers are finding that students with individualized educational plans (IEPs) are becoming class leaders in Zoombinis activities, and 3) patterns have been identified in the players' gamelog data that can reliably be said are consistent with CT. Future work in Zoombinis includes packaging the game for school use with teacher and classroom materials, as well as further development of Zoombinis in alternate media (e.g. AR/VR/XR and/or linear programming).

BACKGROUND

Arising out of data literacy research done at TERC in the early 1990s, *The Logical Journey of the Zoombinis* was created by Scot Osterweil and Chris Hancock to help kids "find the fun" in core mathematical and logical concepts and became an instant sensation in "edutainment" games. Well before the current push for education in CT, Osterweil and Hancock recognized the need for learners to understand the types of problem solving required to design algorithms, networks, and information systems. The designers originally intended to create a game that would engage players in the thinking necessary to understand databases. That was an "out there" idea in the '90s, but hugely salient today.

Osterweil and Hancock were also prescient in understanding that the digital age would bring a learning revolution centered around play. Game-based learning has taken off as a research field and a commercial industry, but it is still rare to find a game where the game mechanic is inherently aligned with a meaningful learning mechanic. Plass, Homer, & Kinzer (2015) explain that it is this alignment between game mechanic (a player's intended activity in the game) with learning mechanic (how players are intended to learn through their game activity)

that also allows the design of an assessment mechanic (how their in-game activity can be used as evidence of learning). *The Logical Journey of the Zoombinis* was the first in a series of three CT games and is still what some consider the first and, arguably, one of the few true learning games.

The original '90s release won numerous awards including the "Best Home Education for Pre-Teens" CoDIE Award. The series also gained an extensive loyal fan base. A Facebook group of 6,000+ members self-spawned without promotion from TERC or any of our partner publishing companies. This fan base became very useful during the re-launch of the game. A pre-release survey received over 1,000 responses with over 150 educators responding with quotes such as:

> *I bought this for my daughter when she was three or four. She's got great logic and spatial skills as a result. However, I used to play it every night after putting her to bed. I swear it helps me learn new things and keeps my mind sharp. I love it.*

> Zoombinis *helped develop many of the logical thinking skills that I use daily as a programmer and have made me so successful.*

> *At 25, I recognize how much the pattern recognition and logic games actually benefited me and taught me some serious critical thinking.*

> Zoombinis *was incredibly valuable when I homeschooled my kids. They love, love, loved it. We all played it. Now they're in college, and taking computer coding. And surprize, surprize, they have suddenly realized why they're so good at it.*

> *I used it in an after-school program for underprivileged kids and it was their first exposure to computer games and using logic. It was a huge hit!*

With this kind of encouragement, TERC set upon re-releasing the game.

THE RELAUNCH OF ZOOMBINIS

Zoombinis was originally developed in the 90s by TERC in partnership with Broderbund. Two sequels followed in the early 2000s, with much success. But with the dot-com crash and collapse of the edutainment market, *Zoombinis* fell on hard times, passing through the hands of a series of publishers with no updates or maintenance. By 2010, it was hard to find a PC/Mac that *Zoombinis* would run on. Nevertheless a hard core fan base of *Zoombinis* players and educators persisted, keeping old machines running and tweaking configurations to keep the game alive.

The rapid onset of iPad and Android tablets offered a perfect interactive experience and new opportunity for *Zoombinis* to be reborn. After some discussion with the publisher Houghton Mifflin Harcourt, who then held the rights to *Zoombinis*, the game was released back to TERC along with a hard drive of all the original assets including the audio files and artwork.

Based on the educational value of the game, the core base of enthusiastic fans, and the coming of tablets, TERC's Board funded the redevelopment of *Zoombinis* for tablets. TERC chose the highly-regarded Boston-based FableVision Studios, working with Learning Games Network (where Scot Osterweil worked), to redevelop and re-release *Zoombinis* for today's audience and modern devices. A marketing firm, The Game Agency, who in turn involved Tinsley PR, were key players in raising awareness of the relaunch.

The re-launch of *Zoombinis* relied heavily on previous fans. In addition to a fan advisory board and a new Facebook page centered around the redevelopment effort, TERC launched a Kickstarter to 1) raise additional funds to enhance the redevelopment and 2) further engage new and old fans alike. The

Kickstarter raised over double its goal, ending at a little over $100,000, which covered development for the Mac, Windows, and Amazon Kindle platforms as well as improvements to the game itself. *Zoombinis* launched anew in fall of 2015.

By the time research was launched in 2016, the market had rapidly shifted. Most schools were using Chromebooks by then, so a WebGL version was developed for our research study and to bring the game further into the school market. Knowing that the functionality of some puzzles would have been compromised if the interface was scaled down for small phones, the decision was made to stick with tablets. Since smartphones are now bigger, development is under consideration for the newer, larger phones.

The re-release of *Zoombinis* has now been in the marketplace for over three years with several maintenance updates. TERC partnered with Encore Software for the desktop release and *Zoombinis* became a #1 paid app in the Educational section of the MacOS App Store. The re-release won a Parents' Choice Silver Honor Award and a REVERE Award in the "Beyond the Classroom, Play category."

PREMISE/SUMMARY OF THE GAME

Zoombinis is an adventure puzzle game where players must guide their pack of adorable Zoombinis on their journey to Zoombiniville to escape the evil Bloats who wish to do them harm at every turn. Players lead packs of 16 Zoombinis through a series of 12 puzzles (each with four levels of difficulty), eventually having to get 400 Zoombinis to their new village, Zoombiniville, to win the game. The ever-changing puzzles, where the rules are different for each new pack of Zoombinis, mean players must figure out *how* to solve the puzzle, not learn specific solutions.

Each Zoombini has a unique combination of hair, eyes, noses,

and feet. The game begins with a Zoombini creator where players can customize their pack of 16 (e.g. creating all one feature the same to reduce the ambiguity of the puzzles, or just making a group of Zoombinis that they like) or they can choose a random group and be on their way.

Figure 1: The Zoombinis Map tracks player progress through the game (Journey mode) and allows players to jump directly to any of the 12 puzzles at any of the four levels (Practice mode).

Puzzles require players to sort, match, and sequence their Zoombinis by attributes to solve the challenges and traverse the land (see Figure 1). For example in the puzzle shown in Figure 1, Allergic Cliffs, players must figure out which Zoombinis can cross which of the two bridges, with each bridge supported by a cliff face with Zoombini-related allergies. In Figure 2, for example, the upper cliff face is allergic to pink noses, while the lower cliff is allergic to all non-green noses. At higher levels, the

allergies become more complex (e.g., green noses and propeller feet).

Figure 2: A screenshot from the Zoombinis puzzle, Allergic Cliffs.

STUDYING COMPUTATIONAL THINKING IN ZOOMBINIS

Many of the skills applied in *Zoombinis* gameplay falls under the category of Computational Thinking. Computational Thinking (CT) is the set of ideas and practices considered vital for computer science skills, and has been attracting increased attention over the past several years in K-12 education (Barr & Stephenson, 2011; Grover & Pea, 2013; Shute, Sun, & Asbell-Clarke, 2018; Weintrop et al., 2016; Wing, 1996). When studying Zoombinis, we focus on four fundamental facets of CT:

Problem Decomposition: The reduction of ambiguity or complexity of a problem by breaking it into smaller, more

manageable parts. This is comparable to isolating variables or systems to test.

Pattern Recognition: The recognition that objects are arranged following a rule or rules. The identification of groups of solutions or characteristics of solutions that can be categorized.

Abstraction: The removal of details to identify and extract relevant information to define main idea(s) or solutions.

Algorithm Design: The creation of an ordered list of instructions for solving a problem or doing a task. The creation or explication of general solutions to a problem or family of problems.

In a national implementation study, over 50 classes in grades 3-8 used *Zoombinis* as part of their STEM or general education curriculum. Teachers spent at least 10 hours of class time having kids play the game and/or using offline activities that helped make connections between the game puzzles and CT. Students were also encouraged to play the game at home.

The class activities were designed to help bridge the *implicit* learning that occurs in the game to *explicit* learning in classrooms. Learners often demonstrate more knowledge in their everyday activities than they are able to express on a test or assignment at schools (Sternberg, 1996). When players learn in games, that knowledge may be implicit—demonstrated through behaviors but not expressed in words by the learner—and need to be leveraged by teachers for classroom learning (Rowe et al., 2014; Thomas and Brown, 2011).

EdGE at TERC designed a set of materials teachers could use to help bridge implicit game-based learning in *Zoombinis* to explicit CT learning in their classroom. Some of the classroom activities had the class act out the puzzles, where some of the class were the rule makers and the others had to follow them. The teacher could support their learning by asking questions about patterns

and abstractions while the students "become" the puzzle. Other activities used graphical organizers, such as data tables, to help students keep track of their information as they solved the puzzles. Many of the activities made connections to STEM learning as well as CT.

To study the development of implicit and explicit Computational Thinking, the research team at EdGE conducted a nationwide implementation study in the 2017-18 school year with over 30 classes of upper elementary and middle school students. Not only did EdGE observe classroom practice and collect log data from teachers about how they used *Zoombinis* in the classroom, they also collected log data from the game, recording every game event with a timestamp and a playerID.

EdGE worked with colleagues from University of Pennsylvania to build and validate implicit CT learning assessments in *Zoombinis*. They used Educational Data Mining (EDM) methods grounded in extensive video and screen capture observations. First researchers analyzed observations of over 70 players playing the first two levels of three of the *Zoombinis* puzzles: Allergic Cliffs, Pizza Pass, and Mudball Wall, and have identified common strategies with high inter-rater reliability (Rowe et al., 2018). And now EdGE is building EMD models to automatically detect that evidence within players' data logs.

EdGE also worked with Empirical Games to build and validate a series of online assessment tasks that measure CT outside the context of *Zoombinis*. During the implementation study, each class completed a 30-minute pre- and post-test with these tasks, which are used as a measure of their CT gains during the study period. Teachers also gave independent ratings of each of their students' CT skills.

Analysis from this study is expected to be completed in early 2019. EdGE will compare the strategies players used in the game

to their performance on external pre/post tests of CT, as well as how their teacher rated their CT practices. EdGE also looks at how much bridging teachers did in each class. They anticipate that learners who demonstrate strategies consistent with CT and who are in classes with high bridging will show the greatest performance on external post-tests of CT, when accounting for their pre-tests.

In discussions with teachers in the study, they reported that often their learners who typically struggle in class were excelling with *Zoombinis*. CT may come more naturally to learners who have cognitive challenges, such as autism, because they may be strong at seeing patterns and abstracting those patterns. Companies such as Microsoft recognize this overlap, starting hiring programs specifically for people with autism. The team is looking at ways to leverage this fun and engaging way of reaching learners who may have many talents, but who may need other ways to express them.

THE FUTURE OF *ZOOMBINIS*: WHAT'S NEXT

Zoombinis serves as both an entertaining activity and as a game-based educational tool. Early research shows that its impact in the classroom is positive, particularly for learners who may struggle academically.

As part of the research, a suite of classroom activities has been developed, intended to support teachers' bridging of game-based learning to classroom learning. These activities include Teacher Guides for off-line and online activities; connections to coding, science, and math; and wall posters and other materials that teachers can use to support the connections between gameplay and other activities. Now that the research is coming to a close, TERC plans to package the game and educational materials in a classroom product.

The team is also seeking ways to extend *Zoombinis* gameplay to

the next generation of learners. Ways to use Augmented Reality and even Virtual Reality are being considered to create immersive and multiplayer *Zoombinis* experiences. As the game moves to new platforms and media, the team behind *Zoombinis* will endeavor to keep the quality of the game experience and the learning experience to as high a standard as it has enjoyed for the past two decades.

REFERENCES:

Barr, V., & Stephenson, C. (2011). Bringing computational thinking to K-12: what is Involved and what is the role of the computer science education community? *ACM Inroads*, *2*(1), 48-54.

CSTA (2018). Retrieved from https://www.csteachers.org/page/standards

Google (2018). Retrieved from https://edu.google.com/resources/programs/exploring-computational-thinking/

Grover, S. and Pea, R. (2013). Computational Thinking in K–12: A Review of the State of the Field. *Educational Researcher*, *42*(1), 38-43.

Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015). Foundations of game-based learning. *Educational Psychologist*, *50*(4), 258-283.

Rowe, E., Asbell-Clarke, J., Bardar, E., Kasman, E., & MacEachern, B. (2014). Crossing the bridge: Connecting game-based implicit science learning to the classroom. Paper presented at the 10th annual Games+Learning+Society conference in Madison, WI, June 11-13.

Rowe, E., Asbell-Clarke, J., Baker, R., Gasca, S., Bardar, E., & Scruggs, R. (2018, April). Labeling Implicit Computational Thinking in Pizza Pass Gameplay. Late-breaking work presented

at the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI 18), Montreal.

Shute, V. J., Sun, C., & Asbell-Clarke, J. (2017). Demystifying computational thinking. Educational Research Review, 22, 142-158.

Sternberg, R. J. (1996). *Successful intelligence: How practical and creative intelligence determine success in life* (pp. 191-192). New York, NY: Simon & Schuster.

Thomas, D., & Brown, J. S. (2011). A new culture of learning: Cultivating the imagination for a world of constant change (Vol. 219). Lexington, KY: CreateSpace.

Weintrop, D., Beheshti, E., Horn, M., Orton, K., Jona, K., Trouille, L., & Wilensky, U. (2016). Defining computational thinking for mathematics and science classrooms. *Journal of Science Education and Technology, 25*(1), 127-147.

Wing, J. M. (2011, March). Computational thinking. In *VL/HCC* (p. 3).

THE ARCHITECTURE OF ASSASSIN'S CREED II'S FLORENCE

An Analysis with the History-Game Relations (HGR) Framework
GABRIELE ARONI

INTRODUCTION

The technology used in digital games allows us to visit the most disparate locales with a higher and higher degree of fidelity. In most cases scenery and events are fictitious in nature, but there are also many instances of historical reconstructions. A case that stands out is undoubtedly the massively popular *Assassin's Creed* series, (Ubisoft, 2007-present) that has made of its historical locations a major characteristic and point of the overarching plot. This article will explore how the city of Florence during the Renaissance is represented in the game *Assassin's Creed II*. (Ubisoft, 2009) Florence, as well as Venice and San Gimignano, two other cities depicted in the game, stand in a particular position as regards their historical representation, for they have been preserved largely intact – albeit with notable, but not too extensive, changes – since the time of the game's setting in the 15th century. Moreover, it is this very characteristic of being mostly unchanged – compared, for example, to the New York of *Assassin's Creed III* (Ubisoft, 2012) or the Paris of *Assassin's Creed Unity* – (Ubisoft, 2014) that shaped their look in the collective imaginary, not to mention the millions of tourists that visit these cities every year. In order to analyze how the city of Florence has been recreated in *Assassin's Creed II*, how it has been adapted to

satisfy both the needs of a functional and entertaining game, and what people would expect from the 'Cradle of the Renaissance', we will use the "History-Game Relations Framework" (HGR) during the first phase of the game set in Florence. The HGR Framework is a tool developed by Vincenzo Idone Cassone and Mattia Thibault to "conceptualize the ways in which history is shaped and adapted and to approach how this adaptation influences the representation and perception of history itself" (2016, 167) in digital games.

STORY AND GAMEPLAY OVERVIEW

Assassin's Creed II is a third-person, 3D, open-world action/ adventure game developed by Ubisoft Montreal and released in 2009. It is a direct sequel to the 2007 *Assassin's Creed* (Ubisoft, 2007) and continues the same overarching story of a conflict between the two secret societies of Templars and Assassins over the possession of mysterious artefacts, called "Fruits of Eden", so powerful that they are capable of controlling the flow of history. Set in the present, the 'frame plot' sees the character of Desmond, an Assassin, using a device called Animus to revive the memories of his ancestors in order to discover where the "Fruits of Eden" are located. This allows for the developers to freely set the various episodes of the series in different historical epochs without changing or disturbing the main plot. *Assassin's Creed II* is set in Italy during the Renaissance, from 1476 to 1499. The player will impersonate Ezio Auditore, a Florentine whose family is wrongfully accused and put to death. This will set Ezio on a course of revenge that will span several cities in Italy and will see the player participate in historical events such as the Pazzi conspiracy and the siege of Forlì (albeit this one placed 11 years prior to the real fact) as well as meet historical characters such as Lorenzo de' Medici and Leonardo da Vinci.

Assassin's Creed II allows players to freely explore the environment from a third-person perspective and the focus of

the game is exploration – the map is revealed by climbing high vantage points, usually towers and monuments –, stealth action and combat. Since the player is an Assassin, the main missions usually involve the assassination of a target, whereas the many secondary missions vary from rooftop running competitions to more platform-oriented tomb raiding. Interaction on the development of the story is limited, but the narrative framework offers an explanation for this fact: it is impossible, for example, to kill Lorenzo de' Medici, since the game is the recollection of a person who lived through that time, and thus the (his)story cannot be altered.

THE HGR FRAMEWORK

The History-Game Relations framework applies the historical discourse theory of Lozano, (1987) which affirms that "history as a discipline is an activity that involves 1) selecting elements; 2) ordering and drawing connections between those elements; and 3) putting them into perspective through a reconstruction or narration." (Cassone & Thibault, 2016, 159) Following this theory, Cassone & Thibault outline three procedures to implement history into digital play:

- **Setting**. The selection of historical elements present in the game: if only as a setting; if a visual detailed reconstruction, on which scale and level (for example, a macro scale for games such as *Civilization VI* (Firaxis Games, 2016) or a micro scale, to the level of clothes and characters for *Assassin's Creed*). It also includes the visual aspect of the reconstruction.

- **Modelling**. How the historical factors are represented and influence the game and gameplay. In *Call of Duty: WWII* (Sledgehammer Games, 2017), history influences the gameplay in a limited manner, whereas in *Europa Universalis IV* (Paradox Development Studio, 2013) there are plenty of historically grounded variables.

- **Representing**. How the historical setting/events are represented in the game, via text, graphics, etc., which includes the narrative aspect. If the game is in first person or not, or from the perspective of a single character or multiple characters, etc.

Cassone & Thibault then apply the semiotic theory of Uspenski (1988) stating that "the processes of collective representation of history can be approached as a semiotic translation" (2016, 162) through three forms of translation:

- **Perspectival**. The act of 'translating' the past to present language. The selection of the time period and its depiction will vary based on interpretation. The same goes for the visual adaptation and this is on what this article concentrates.

- **Digital**. This is the actual translation from the original source, such as a real building, or an ancient drawing or text, to the digital format of the game. This is where technical and hardware limitations come into play to determine how history is represented (i.e. the absence of the Baptistery in Florence in *Assassin's Creed II*).

- **Ludic**. How historical accuracy and plausibility are bent (or not) in order to work with the gameplay and to translate in an enjoyable game. If the historical elements are integrated in the game mechanics, etc.

The intersection of the three procedures of implementation of history in games with the three forms of translation forms the History-Game Relations (HGR) schema (see Table 1), that can be represented in a matrix and read either horizontally, to see how the processes of history implementation are translated, or vertically, to see how the translations are applied to the various processes. (2016, 168-170)

	Perspectival translation	**Digital translation**	**Ludic translation**
Setting (Selection of the elements and of the setting based on:)	Contemporary trends, influence of other media, fashionable historical periods	Hardware limitations and software potentials	Presence in the era of elements adaptable to the medium (wars, iconic figures...), Adaptability to specific digital games genres.
Modelling (Building relations and dynamics of the simulations according to:)	Theories of historical development, Historiographies, Educational narratives and storytelling	Limits and features of the historical engine (i.e. gameified historical dynamics)	Basic elements of gameplay, Players agency, game-genre dynamics, Features of playfulness.
Representing (Creation of representations and narratives based on:)	Narration models commonly used to represent history (historical fiction, novels, documentaries, etc.)	Graphic regimes, Ergodic/linear narratives, narration potentials determined by the graphic engine, use of other media (images, cinematics, comics, texts)	Game genre typical perspectives, focus on controllable elements, informativeness of the vision/narration

Table 1. From Idone Cassone & Mattia Thibault, (2016) "The HGR Framework A Semiotic Approach to the Representation of History in Digital Games". Gamevironments, Special Issue "Gamevironments of the Past" (05), 168.

In this article, we will focus on the visible architectural component of *Assassin's Creed II*, thus on the various translations of the Setting procedure of the HGR Framework, in order to see how Renaissance Florence has been adapted in *Assassin's Creed II*.

A TOUR OF THE FLORENCE OF ASSASSIN'S CREED II

The primary role that the settings play in the game is clear as soon as the avatar of the player, Desmond, steps into the Animus to revive the memories of his ancestor Ezio Auditore. The game offers a pan on the main monuments of Florence, first the Palazzo della Signoria and then Santa Maria del Fiore, followed by the text "Repubblica Fiorentina, 1476". The opening scene, and the first interactive part, is set on one of the most recognizable and well-known spots of the city: the Ponte Vecchio (Old Bridge). As many of the other monuments represented in the game, we can already see how the reconstructions of

buildings and locales in *Assassin's Creed II* are "neither strictly historical nor present a thoroughly imagined representation of any time period or place. Rather, they exist in a curious landscape situated somewhere between the two". (Westin & Hedlund, 2016, 4) The current jewelry shops that occupy the bridge have been replaced with more accurate food shops (even though butchers would have been the historically correct choice), but on the east side the Vasari Corridor, an elevated passageway that connects the Palazzo Vecchio to Palazzo Pitti, is present on top of Ponte Vecchio, and it was not built until a century after the events depicted in the game. It is interesting to notice, however, how the depiction of the Vasari Corridor does not exactly correspond to how it looks today, but is rather an adaptation, in order to display how the bridge looked different half a millennium ago, but not to make it too different, and still leave the general form that can be easily linked to the typical imagery of the contemporary Ponte Vecchio, an approach that is adopted in the vast majority of the monuments represented in *Assassin's Creed II*. After this introductory scene, Ezio is challenged to a race by his brother Federico, that will introduce us to one of the main mechanics of the game, the free-roaming and climbing of buildings in order to reach a high point from where to observe the city and thus reveal the map. With the small figures of Ezio and Federico standing atop a bell tower and the massive outline of the cathedral of Santa Maria del Fiore and Brunelleschi's dome in the background, the title of *Assassin's Creed II* appears, 'officially' declaring the beginning of the game, and showing once more how architecture and the environment is the protagonist, almost more so than the characters.

We will now proceed to analyze the reconstruction of the city of Florence in *Assassin's Creed II* through the lenses of the HGR Framework, concentrating on the historical Settings procedure and how it has been semiotically translated into a digital game.

SETTING

As mentioned, Assassin's Creed II is set in Renaissance Italy, spanning 23 years from 1476 until 1499. The locations of the game are Florence, Venice, San Gimignano, Forlì, Monteriggioni and the countryside of Tuscany. These cities are reconstructed in their entirety and are freely explorable by the player. To complement the reconstruction, real historical characters, such as Machiavelli and Leonardo da Vinci, and real historical events, such as the Pazzi conspiracy, are present, albeit often with slight modifications. The general image the public has of the city of Florence has been built much by contemporary tourism, but has been shaped in the past centuries starting exactly around the time the game is set, with views of the city from the paintings of artists such as Masaccio, Botticelli and Ghirlandaio. These views embody all the transformations that took place in the cultural life of Quattrocento Florence, and are not mere graphic representations of the city, culminating in the aerial perspective of the Pianta della Catena of circa 1472. (Fanelli, 2002, 76-7) The representation of Florence in Assassin's Creed II is the result of a certain cultural and technological context as well.

PERSPECTIVAL TRANSLATION

Douglas N. Dow considers Assassin's Creed II's Florence a simulacrum rather than a simulation, where anachronisms are used to make the city more recognizable and similar to what it is today, at the risk of confusing the player, (Dow, 2013, 220) and Westin & Hedlund affirm that by analyzing the Rome of *Assassin's Creed: Brotherhood* (Ubisoft, 2010) we can understand the "contemporary public's collective idea of late fifteenth century". (2016, 7) The shape of the historical center of Florence has remained largely unchanged since the 14th century, contained within the walls designed by Arnolfo di Cambio during the previous century (and now replaced by boulevards), and has been quite accurately represented in *Assassin's Creed II*,

save for its scale (see the Ludic section). The relative position of the various monuments is generally correct, so much so that it is not impossible to orientate ourselves in the real city based on previous experience in the game. Of course, not all buildings are faithfully represented in the game, but Ubisoft managed to skillfully select a few topoi of Florentine buildings to create the urban landscape in order to make it believable and recognizable. We can see *altane*, loggias placed atop of buildings, framed windows and the typically Florentine overhanging eaves of the roofs. Some buildings, such as the palace of Ezio's love interest Cristina Vespucci (a probable allusion to Simonetta Vespucci, a legendary Florentine beauty who died the same year the game starts, and who might have been the model for the Venus of Botticelli), have façades covered with *sgraffito*, a technique that uses contrasting plaster colors, and that was popular in Florence in the 15th century. Some of the textures of *sgraffito* façades come from photographs of the façade of the Palace of Bianca Cappello, which is still in Florence, but that would only be built a century later, whereas the other textures come from the frieze in the interior courtyard of the Medici Palace, which indeed already existed, and is visible during the game. This choice shows how the selection was based on what is still visible today, as well as on a choice of the most notable and recognizable examples, to which the façade of the Palace of Bianca Cappello undoubtedly pertains. The palace of the Auditore family as well, is the exemplification of the Florentine typology of the *palazzo* that was established in the 15th century by architects such as Michelozzo, Alberti and Giuliano da Sangallo, working for rich bankers and merchants of the city, such as the Medici and Rucellai, a perfect fit for the Auditore family, bankers as well, working for the Medici. Palazzo Medici is in fact quite well reconstructed in the game, with the omission of the large extension added in the 17th century, and displaying its original square floorplan.

Proceeding in the game, we are welcomed by Ezio's father,

Giovanni, at the doorstep of the Auditore Palace, which leads to the square open courtyard covered in white plaster with grey pietra serena ornamentation, common to these types of buildings. Exploring the city, we come into contact with the other main Florentine monuments, where we can see more of the translation that Ubisoft effected. The cathedral of Santa Maria del Fiore, often called Duomo, sports an unfinished façade, the sign of a changing city, together with other buildings under construction, and it is what Dow calls, citing Annette and Jonathan Barnes, (1989, 258) a "nonobvious anachronism". (Dow, 2013, 220) The façade of Santa Maria del Fiore was indeed incomplete in the period between 1476 and 1499, and the part that existed, constructed in the 14th century, did resemble in some form what is displayed in the game. However, the under-construction façade of *Assassin's Creed II* represents a partial contemporary façade of the cathedral, built only in the 19th century. What is interesting, is that the 19th century façade itself was designed to 'simulate' a 14th century one, and even today, many people ignore that there is almost half a millennium difference between the construction of the cathedral and its façade. A similar situation is repeated with the church of Santa Croce, where the 19th century façade, again designed in 14th century Gothic style, is present in the game. Unsurprisingly, the façade of the church of San Lorenzo is left unbuilt, as it stands today, a clear sign that the work done by Ubisoft was meant not to overly distance the reconstruction from the contemporary aspect of the city of Florence, while at the same time hint that there have been changes and that we are exploring the past.

In fact, the major transformations that took place on a large scale in the city, mainly the construction of the Uffizi in the 16th century, and the transformation of the Old Market at the end of the 19th, are not represented. Especially the demolition of the Old Market and a large part of the old city center visibly changed the look of Florence, particularly the creation of Piazza della

Repubblica between Santa Maria del Fiore and Palazzo della Signoria. This selective choice does not come as a surprise, as the 19th century redesign of the center, unlike the aforementioned façades of Santa Maria del Fiore and Santa Croce, did not try to emulate the previous design of the city, but rather modernize it to the standards of other European capitals such as Paris and Vienna, (Fanelli, 2002, 212) and would undoubtedly have been detrimental to the appearance of an old Renaissance city that *Assassin's Creed II* aims to convey. Leon Battista Alberti in his *De Re Aedificatoria*, first published 20 years before the events of *Assassin's Creed II*, mentions how the cities that he knew as made of wood as a child, were now made of marble. (Alberti, 1989, p. 384) In the game, some elements are designed to give the impression of a city in development, as it was at the time, such as the bridge of Santa Trinita, next to Ponte Vecchio, which, similarly as regards the façade of Santa Maria del Fiore, was not under construction during the time of *Assassin's Creed II*, and especially did not have the form that it would only acquire with its reconstruction after a flood in the 16th century. These examples show how "once authenticity or historical accuracy cease to be overriding concerns, it is possible to see how *Assassin's Creed II* presents a view of Florence that emphasizes 'its meaning, not its physical being,'" (Dow, 2013, 227) and how the translation has been done in the optic, not of producing a historically accurate reproduction, but rather an interpretation that could be as comprehensible as possible to the large public.

DIGITAL TRANSLATION

The possibly most glaring omission in the game, the Baptistery of San Giovanni in Florence, is due not to an interpretation by Ubisoft, but rather to technological limitations, falling thus under the Digital translation. In an interview, Corey May, lead writer of *Assassin's Creed II*, affirmed that the Baptistery was not placed in the game because of the lack of memory to store the unique textures that it would have required. (Bailey, 2012) So, the

selection of which buildings to represent in the game was not exclusively a matter of how to translate Florence for the audience of a contemporary digital game, but based also on technical factors. This also explains the aforementioned repetitions of *sgraffito* façade decorations, as well as other materials, which was effected in order to save memory space by repeating the same textures. Other important buildings, such as Orsanmichele or Palazzo Strozzi, were most likely victims to the same fate, and Ubisoft probably preferred to keep the skyline of the city as intact as possible, since it is often explored from rooftops, and thus include buildings that are not historically accurate but highly influential to the contemporary 'postcard' panorama of the city, such as the 17th-18th century dome of the Cappella dei Principi, next to the church of San Lorenzo, whereas historically appropriate and important buildings, but smaller in scale, such as the Baptistery, were omitted. The lack of interiors for most of the buildings, or their limit to specific missions, is another decision clearly influenced by hardware limitations, which will in fact be changed with subsequent games in the series, such as *Assassin's Creed Unity*. (Ubisoft, 2014) At the same time, *Assassin's Creed II* offers a three-dimensional reconstruction of Florence on an unprecedented scale, and the level of detail is flexible enough to offer panoramic vistas and minute features. Moreover, the advantages of real-time engines in terms of exploratory possibilities are self-evident, and regardless of the accuracy of the reconstruction, the possibility of walking around the streets and monuments adds to the verisimilitude.

LUDIC TRANSLATION

One of the most obvious aspects of the architectural reconstruction of Assassin's Creed II that has not been mentioned yet is scale. The city itself, and every building in it, have been noticeably scaled down. This is a result of Assassin's Creed II being primarily a digital game and thus having the ludic aspect as its main concern. As more majestic as it would appear,

taking half an hour to climb Giotto's bell tower would hardly be entertaining, without even counting the fact that ledges and moldings would be too far away from each other to offer viable holds. Real horizontal distances as well would be detrimental to gameplay, as it would take three or four minutes just to run from one edge of the cathedral of Santa Maria del Fiore to the other, and about half an hour to cross the whole city. These distances would also make it impossible to jump between many buildings, especially across the streets. Despite the buildings in Florence being built close to each other, the jumps would have to be even more unnaturally long than they already are. Even the plan of the city has been adapted, both as a result of the technological limitations outlined in the previous paragraph, as well as gameplay constraints. At the same time, the towers, buildings and narrow roads of medieval towns are the perfect setting for a parkour exploration game such as Assassin's Creed II. When Ezio's father is imprisoned, he is taken to the Albergaccio, a 'maximum security' prison cell on the tower of Palazzo della Signoria that still exists and that was really used to hold high-profile political prisoners. This event triggers the mission of having to climb the tower in order to reach Giovanni Auditore, an example of how much architecture is integrated into the gameplay. Other landmarks become functional to the action as well, such as the cloister of Santa Croce, where Ezio is tasked with the assassination of Uberto Uberti and even real events are aptly used in the game, such as the sword fight in front of Santa Maria del Fiore during the Pazzi conspiracy.

CONCLUSION

By playing and exploring the Florence of *Assassin's Creed II* and 'reading' it with the HGR Framework, we can see how historical settings are adapted in digital games, but it also gives interesting insights as to how historical architecture is interpreted by the public and what the expectations of the players are. Dow, in fact, mentions 18th and 19th century authors, including Goethe,

who were surprised at how different the real monuments of Italy looked from the illustrations that they had seen. (Dow, 2013, 222-3) The representation of architecture influences how people see it, and considering the massive exposure that digital games have, their study is all the more relevant.

REFERENCES

Alberti, L. B. (1989). *L'Architettura*. (P. Portoghesi, Ed., G. Orlandi, Trans.). Milan: Il Polifilo.

Bailey, K. (2012, November 2). Filling in the Corners: Bringing Assassin's Creed's Historical Worlds to Life. Retrieved December 26, 2017, from http://archive.is/JCC1o

Barnes, A., & Barnes, J. (1989). Time Out of Joint: Some Reflections on Anachronism. *Journal of Aesthetics and Art Criticism*, *47*(3), 253–261.

Cassone, V. I., & Thibault, M. (2016). The HGR Framework A Semiotic Approach to the Representation of History in Digital Games. *Gamevironments, Special Issue "Gamevironments of the Past"* (05), 156–204.

Dow, D. N. (2013). Historical Veneers: Anachronism, Simulation, and Art History in Assassin's Creed II. In M. W. Kapell & A. B. R. Elliott (Eds.), *Playing with the Past. Digital games and the simulation of history* (pp. 215–231). New York: Bloomsbury.

Fanelli, G. (2002). *Firenze* (VII). Rome: Laterza.

Firaxis Games. (2016). *Civilization VI* [Microsoft Windows, macOS, Linux]. United States: 2K Games.

Lozano, J. (1987). *El discurso histórico*. Madrid: Alianza.

Paradox Development Studio. (2013). *Europa Universalis IV* [Microsoft Windows, OS X, Linux]. Sweden: Paradox Interactive.

Sledgehammer Games. (2017). *Call of Duty: WWII* [Microsoft Windows, PlayStation 4, Xbox One]. United States: Activision.

Ubisoft. (2007). *Assassin's Creed* [PlayStation 3, Xbox 360, Microsoft Windows]. Canada: Ubisoft.

Ubisoft. (2009). *Assassin's Creed II* [PlayStation 3, Xbox 360, Microsoft Windows, Mac OS X]. Canada: Ubisoft.

Ubisoft. (2010). *Assassin's Creed: Brotherhood* [PlayStation 3, Xbox 360, Microsoft Windows, Mac OS X, PlayStation 4, Xbox One]. Canada: Ubisoft.

Ubisoft. (2012). *Assassin's Creed III* [PlayStation 3, Xbox 360, Microsoft Windows, Wii U]. Canada: Ubisoft.

Ubisoft. (2014). *Assassin's Creed Unity* [PlayStation 4, Xbox One, Microsoft Windows]. Canada: Ubisoft.

Uspenskij, B. (1988). *Storia e semiotica*. Milan: Bompiani.

Westin, J., & Hedlund, R. (2016). Polychronia – negotiating the popular representation of a common past in Assassin's Creed. *Journal of Gaming & Virtual Worlds*, *8*(1), 3–20.

ACKNOWLEDGMENTS

PLAYERS AS TRANSITIONAL CHARACTERS

How Youth Can "Breakaway" from Gender-Based Violence
HUA WANG, YISHIN WU, JI HYE CHOI, & ANN DEMARLE

Gender-based violence is a major global health and human rights issue. It is prevalent and takes place in a wide range of forms from discrimination and bullying to sex trafficking and femicide. At least one in every three women in the world will experience gender-based violence in her life time, be it physical, psychological, and/or sexual (World Health Organization, 2017). These traumatic experiences can cause severe damages to individual victims and social institutions (Heise, Ellsberg, & Gottmoeller, 2002; United Nations Population Fund, 2017). Exposure to such violence and accepting it as the norm at a young age can significantly increase the risk of an individual becoming a perpetrator or a victim later in life (García-Moreno, Jansen, Ellsberg, Heise, & Watts, 2005). Therefore, early interventions among youth are crucial for tackling this complex issue.

As part of the UNiTE Campaign to end violence against women and girls, *BREAKAWAY* is a digital game designed by the Champlain College Emergent Media Center with support from the United Nations Population Fund. The design team chose football (or soccer in the United States) as a universal language to engage young players, particularly those between the ages of 8 and 15, to reflect and discuss gender-based norms, values, and associated behaviors. Since its debut at 2010 FIFA World Cup,

BREAKAWAY has been played by youth in over 180 countries. Gender stereotypes and gender-based violence are deeply entrenched in many countries. However, with events such as the "GamerGate" controversy arising out of misogyny within the gaming community and most recently the #MeToo movement that is breaking the walls of silence against sexual assault, the *BREAKAWAY* initiative is more meaningful than ever.

PATHWAYS TO CHAMPIONSHIP

There are at least two unique characteristics about the *BREAKAWAY* design process that enabled youth to become champions for social change. One is the role modeling structure that guided the character development so the players can be part of the narrative as transitional characters. The other is the participatory approach that allowed the members of the design team to take ownership and transform this project into a grassroot initiative.

Successful games do not always have to include narrative elements (c.f., Gee, 2007). However, when they are thoughtfully incorporated in the game design, the narrative impact has great pontential for deeper learning, emotional connection, and positive change (Wang & Singhal, 2009). For almost half a century now, media producers have purposefully created characters and storylines in television and radio dramas to address difficult topics and serve vulnerable population groups such as women and children (Singhal, Cody, Rogers, & Sabido, 2004; Singhal & Rogers, 1999). Many of these entertainment-education programs have been inspired by the work of Mexican writer-producer-director Miguel Sabido.

Drawing upon his production experiences and understanding of Bandura's social learning/cognitive theory, Bentley's dramatic theory, and Jung's archetypes, Sabido formulated a production methodology including key elements such as a moral grid

derived from the framework of a specific educational issue; social modeling through the protagonist, antagonist, and transitional characters; epilogues to spur discussions, and infrastructure to provide accurate information and further assistance to change (Sabido, 2004). Among them all, the social modeling approach based on Bandura's social learning/cognitive theory is arguably the most critical part. The audience learn from positive role models through their rewards and from negative role models through their punishment. Even more importantly, transitional characters can demonstrate the change process from tremendous suffering, contemplating about obstacles, to eventually making decisions and taking actions that lead to the ultimate triumph. The Sabido methodology has been used internationally since the 1970s, changing the lives of millions (Singhal & Rogers, 1999).

By collaborating with Population Media Center, a flagship nonprofit organization known for using the Sabido methodology in narrative development, *BREAKAWAY* is its first adaptation in video games. The game is set in the context of a football tryout and tournament that takes the player on an epic journey through 13 episodes. Tal is the antagonist who embodies the gender stereotype and shows disrespectful behaviors. He is the Captain of the team who is willing to trade anything for a victory. He doesn't think girls can play or even be around the pitch. Raina is the protagonist who takes courageous actions to challenge the gender norm and stand up for what is right. She is ostracized by other teammates not because she was new in town but for being the only girl on an all-male team. And she quickly becomes a threat for Tal as she turns out to be a football talent and holds the potential to take the team to the final win. Another main character is the player's younger sister Hanna, who is an enthusiastic fan of the player and the team. She is also a target of bullying but learns to defend herself as the game unfolds (Figure 1).

Figure 1. An example of social modeling in BREAKAWAY
character development: Raina (left), Tal (middle), and Hanna (right).

The game features three major modes of play: *narrative events, tactical football,* and *skill-building training mini-games*. The player's goal is to become a winning football player. Gameplay is based on football performance and on navigating community-based relationships. *Narrative events* provide the story arc for each episode, creating a context in which the player is prompted to respond to situations filled with escalating gender inequity challenges as the situations all lead to the final instance of gender-based violence – abduction of Raina by Tal. As the events unfold, the consequences of each decision are depicted for the player's consideration. Game players explore the issue of gender-based inequality through their choices, which in turn impact their relationships with teammates and the outcomes of the game. The *tactical system* ties together the rapid paced *mini-games,* which provide pure entertainment and appeal for the player, with thought-provoking narrative decisions, which hold the

message and facilitate game-based learning. *Narrative events* have a direct influence over the difficulty of the tactical system by influencing the player's ability to improve his/her skills. It is in this interlocking design that young players come to understand the outcome of their choices. Literally a player cannot win the game if he/she repeatedly choose negative behaviors towards the female characters in *BREAKAWAY*.

What is different in *BREAKAWAY* is that the design team positioned the player in the narrative as the transitional character. By using a "first person" perspective (c.f., Wardrip-Fruin & Harrigan, 2004), young players start off assuming the gender stereotypes and norms from their social surroundings are acceptable but are soon put through various scenarios that gradually challenge negative attitudes and behaviors toward girls. The educational messages are carefully folded into the character dialogue. The player sees what other teammates would do in these situations as they face tough decisions such as when Hanna becomes Tal's target for bullying. As things quickly build up, the player is asked, "When the game is your life, will you BREAKAWAY?" The mechanics of interactive storytelling takes full advantage of digital games that put the player at the center of the actions with high degrees of freedom (Wang & Singhal, 2009). Instead of the vicarious experience with television and radio dramas, the young players of *BREAKAWAY* get a closer "first-hand" experience when they have the chance in the game to make heroic decisions – decisions of self-discovery – that impact the final game score, the team's outcome in the championship, AND gauge their growth in terms of how they are dealing with the issue of violence against women/girls.

Although the scenarios are realistic when it comes to challenges youth commonly face such as peer pressure, gender-based violence is never explicitly conveyed and it does not demand the young players to take on adult violence. In fact to the players, the theme of *BREAKAWAY* is football first and foremost. The

design team even introduced a real-life international football star, Samuel Eto'o, as a walk-on character in the game to lead the discussion about good sportsmanship! Such celebrity endorsement helps enhance the positive attitudes and behaviors the game advocates without having to preach about gender equality. The celebrity role model also provides more credibility to the embedded educational messages, especially for youth who admire successful athletes on the global stage.

Moreover, the game design process involved more than 100 students over the course of three years, allowing these 20-something heroes to tackle complex social problems and learn through the transformative journey. Indeed this strong sense of ownership during game design and development turned a short-term production project into a long-term, global, grassroot initiative. In 2012, a youth camp model emerged from a student who was inspired to bring *BREAKAWAY* to his hometown in the divided West Bank city of Hebron in Palestine. The Champlain team trained local facilitators and organized 3 youth camps, enabling 120 participants to play the digital game and engage in social activities in the local community. They made history by bringing boys and girls together to play football on the street for the first time. In 2013 and 2014, the *BREAKAWAY* team had the opportunity to work with the United Nations Development Programme and the University of Sonsonate to train local facilitators and organize youth camps in El Salvador, a country with one of the highest per capita rates of femicide in the world. In the following sections, we present selected user experience captured through various innovative methods and summarize the lessons we have learned about *BREAKAWAY*'s educational impact based on data collected from youth camps in El Salvador and a 2016 field study in the United States.

MULTIFACETED USER EXPERIENCE

Over the years, the *BREAKAWAY* initiative has used a variety of methods, both conventional and unconventional, to capture the complicated and dynamic user experience. Three insightful approaches have stood out from a number of field studies for the research team: participantory sketching, gamification, and video recording of players' narrative exposure and response. First, participatory sketching offers young players to use pencils and drawings as non-textual tools for their creative expressions. This method is particularly effective among participants with low literacy, high language barrier, and of silenced and marginalized population groups (Singhal & Rattine-Flaherty, 2006). So when we asked the youth camp participants to sketch out their answers, it provided a critical layer of information in addition to the written words (Wang, Wu, & Choi, 2016).

For example, one of the earlier episodes presented a scenario where Tal was bullying Hanna, demanding her to stay out of the pitch because football is for boys. Participants in El Salvador were asked to draw a picture of Hanna to show how she might feel in that situation and add a bubble to indicate what might be going through her mind (Figure 2).

Figure 2. Participatory sketching by BREAKAWAY youth camp participants in El Salvador, showing their empathetic response: "I am hurt" (left) and "I don't know why they do not allow girls to play if we are all equal" (right).

Second, gamification is an approach that uses game-like thinking, elements, and processes for non-game contexts and common strategies include points, badges, and leader boards (Zichermann & Cunningham, 2011). We used gamification strategies to motivate youth to participant in activities while providing user feedback. To accompany the *BREAKAWAY* playbook for the camp participants in El Salvador, a set of custom stickers were designed and printed (Wang, Wu, & Choi, 2016). These stickers included images of male and female football players with each assigned 10 points. Additional images included other football related objects such as the football, goal, flag, and trophy, with each assigned 5 points. At the end of each day, facilitators graded the journal entries with points and participants were invited to redeem these points for stickers of their own choice. Many young participants chose to place the sticker of a female football player at the center of their field and even as the team captain (Figure 3).

Figure 3. Gamification used for BREAKAWAY players to indicate gender preference in football
games. Choice of female football players on the field (left) and female captain of the team (right).

Third, buidling on previous participatory approaches with players' voluntary responses at youth camps, we conducted a field study in December 2016 in Buffalo, New York, where we used iSpring Free Cam to record participants' computer screen activities during gameplay to obtain unobtrusive and objective meansurement of their narrative exposure and response to questions. We coded each cut scene in seconds and separated the content between narrative (character dialogue) and questions (with choices of answers). Although the number of cut scenes vary across different episodes, we calculated the average exposure time per cut scene throughout the analysis. This method demonstrated the possibility of more accurately measuring each individual's exposure to the narrative content incorporated in *BREAKAWAY*. For example, the line chart below shows four participants' data we were able to record from start to finish (Figure 4). We found from a total of 18 participants (8-10 years old) who played *BREAKAWAY*, the time they spent to read the narrative content ranged from 11.01 to 118.15 seconds per cut scene ($M =31.50$, $SD = 24.27$) and the time they took to answer the questions ranged from 2.34 to 14.33 seconds per cut

scene (M = 7.53, SD = 3.17). Their narrative exposure is positively correlated to their response time, meaning participants who spent more time reading the narrative content generally also spent more time to think before responding to questions. There were 63 cut scenes directly related to the *BREAKAWAY* narrative with the educational messages seamlessly incorporated in the character dialogue. Among those, the average narrative exposure time ranged from 2.89 to 130.73 seconds per cut scene with the longest exposure being 278 seconds on one particular cut scene. Some of the narrative-related cut scenes caught more attention from the players than others as the story arc unfolds; the dotted line in Figure 4 shows the group average across the 13 episodes.
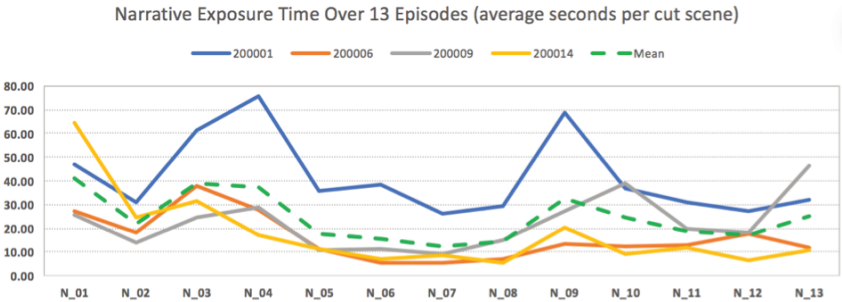

Figure 4. Line chart showing overall trend of narrative exposure data of four BREAKAWAY players

When we calculated the rate of participants choosing prosocial answers as opposed to antisocial answers, we found all of them to have a prosocial rate of at least 50%, with the highest being 90%. Overall, the antisocial rate was low, typically 10% or lower with the worst being 37%. This means even in the United States, we didn't have a single participant who chose prosocial answers 100% of the time. In the worst case, the participant chose an antisocial answer to more than one in every three questions.

However, we also discovered that a majority of the participants (83%), at one point or another during the gameplay, went back

to reread the character dialogue before answering the questions. The reread frequency could be as high as 14 times (M = 5.06, SD = 4.58). Compared to the answers participants chose after having reread the content, 36% of them chose a prosocial answer all of the time and the participants who took part in facilitated group discussions related to the episode they played were more likely to have higher prosocial rates when choosing their answers.

Perhaps it is important for us to point out gender difference tests showed girls generally spent more time reading the narrative and answering questions than boys. The group comparison showed that participants who took part in facilitated group discussions after gameplay generally spent more time reading the narrative, took less time to answer the questions, reread less frequently, and had a higher rate of prosocial answers and a lower rate of antisocial answers.

THE HERO'S JOURNEY

Digital games offer intriguing opportunities to engage youth, prompt them to observe and contemplate complex social and health problems, and extend the gameplay through other complementary activities to promote deeper learning, positive interactions, and behavior change (Ritterfeld, Cody, & Vorderer, 2009). *BREAKAWAY* is the first adaptation of the Sabido methodology of using entertainment media for social change in the context of video games. The game design centered around role modeling through positive and negative characters, message delivery via carefully designed dialogues, and decision points that algorithmically influence success on the football pitch, taken together these created the possibility for the player to become a transitional character in the interactive stories. Such a user-directed narrative experience allowed youth to explore and discover through their choices and arrive at intended positive outcomes through experiential learning. Insights from the *BREAKAWAY* user experience are consistent with the research

on narrative engagement and persuasion through interactive storytelling (Green & Jenkins, 2014). The game mechanics supported the transformation of *BREAKAWAY* players around the world through their journey to become champions and heroes, which in and of itself is already empowering. However, the behind the scenes story of game design students owning the process and then advancing it into a global initiative with training materials, a youth camp model, and a network of local communities brings the heroes' journey full circle. An important lesson learned here is that a game for change like *BREAKAWAY* can serve as not only an effective educational tool but also a catalyst for transformation for young game designers and the players. Together, they can rewrite the script about gender-based norms and eradicate violent behaviors toward women and girls.

REFERENCES

Crowell, N. A., & Burgess, A. W. (1996). *Understanding Violence Against Women*: The National Academies Press.

Emergent Media Center. (2010). *BREAKAWAY* [Video game]. Available at http://www.breakawaygame.com

García-Moreno, C., Jansen, H. A. F. M., Ellsberg, M., Heise, L., & Watts, C. (2005). *Multi-country Study on Women's Health and Domestic Violence against Women: Initial results on prevalence, health outcomes and women's responses*. Geneva, Switzerland: World Health Organization.

Gee, J. P. (2007). *Good video games+ good learning: Collected essays on video games, learning, and literacy* (Vol. 27): Peter Lang.

Green, M. C., & Jenkins, K. M., (2014). Interactive narratives: Processes and outcomes in user-directed stories. *Journal of Commnication, 64*, 479-500,

Heise, L., Ellsberg, M., & Gottmoeller, M. (2002). A global

overview of gender-based violence. *International Journal of Gynecology & Obstetrics, 78*(S1).

National Center for Injury Prevention and Control. (2003). *Costs of Intimate Partner Violence Against Women in the United States.* Retrieved from https://www.cdc.gov/violenceprevention/pdf/IPVBook-a.pdf

Ritterfeld, U., Cody, M. J., & Vorderer, P. (2009). (Eds.). *Serious Games: Mechanism and Effects*. New York: Routledge.

Sabido, M. (2004). The origins of entertainment-education. In A. Singhal, M. J. Cody, E. M. Rogers, & M. Sabido (Eds.), *Entertainment-education and social change: History, research, and practice* (pp. 61-74). Mahwah, NJ: Erlbaum.

Singhal, A., Cody, M. J., Rogers, E. M., & Sabido, M. (2004). *Entertainment-education and social change: History, research, and practice*. Mahwah, NJ: Lawrence Erlbaum.

Singhal, A., & Rattine-Flaherty, E. (2006). Pencils and photos as tools of communicative research and praxis: Analyzing Minga Perú's quest for social justice in the Amazon. *International Communication Gazette, 68*(4), 313-330. doi: 10.1177/1748048506065764

Singhal, A., & Rogers, E. M. (1999). *Entertainment-education: A Communication Strategy for Social Change*. Mahwah, NJ: Lawrence Erlbaum.

United Nations Population Fund. (2017). Gender-based violence. Retrieved from https://www.unfpa.org/gender-based-violence

Wang, H., & Singhal, A. (2009). Entertainment-education through digital games. In U. Ritterfld, M. J. Cody, & P. Vorderer (Eds.), *Serious Games: Mechanism and Effects* (pp. 271-292). New York: Routledge.

Wang, H., Wu, Y., & Choi, J. H. (2016, December). *BREAKAWAY Research Brief* for Emergent Media Center at Champlain College in Vermont, USA and the UNDP in El Salvador. Available at https://breakawaygame.champlain.edu/wp-content/uploads/sites/33/2014/03/BREAKAWAY_Research_Brief_Final-1.pdf

Wardrip-Fruin, N., & Harrigan, P. (2004). *First person: New media as story, performance, and game*: MIT Press.

World Health Organization. (2017). Violence against women. *Fact sheet N°239.* Retrieved from http://www.who.int/mediacentre/factsheets/fs239/en/

Zichermann, G., & Cunningham, C. (2011). *Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps*. Sebastopol, CA: O'Reilly Media.

HEARTHSTONE

Managing Randomness and Collectible Card Game Playing as Collective Cognitive Achievement

NICHOLAS PERSA, KURT SQUIRE & MIKE TISSENBAUM

Over the past twenty-five years, collectible card games (CCGs) have emerged as a cultural phenomenon. *Magic: The Gathering,* which is commonly regarded as the first in the genre, boasts a global player base of 20 million, a professional circuit with $240,000 in awards and a $50,000 cash prize to the winner. As a genre, collectible card games are defined as a game in which players purchase and collect cards which are then assembled into decks and played in head-to-head competition. CCGs typically feature a common "starting" set of cards, "booster packs" that expand the basic set and introduce new cards with particular powers (and differing rarity), and an ever-changing metagame, in which the community identifies superior card combinations and strategies for playing them. This metagame evolves as archetypal decks emerge and players identify weaknesses in it and counter them. Much like poker, hearts, or pinochle, CCGs can be played many ways, ranging from the casual to the competitive. The nature of collectible card games, which feature original artwork and collections of cards, mean that they also support unique modes of engagement, as a player may find pleasure in collecting (or even creating) cards. A truly global game, the top 10 Magic: The Gathering players (measured by all-time "Pro Points") come from five different countries (France, Japan, United States,

Brazil, and Germany), and the reigning lifetime cash leader, Paulo Vitor Damo da Rosa, has earned over $400,000 in cash prizes.

With the 2014 release of *Hearthstone: Heroes of Warcraft*, a CCG based on the World of Warcraft universe boasts over 70 million players globally, CCGs have fully entered the digital era. Playable on mobile devices and PCs, *Hearthstone* is free-to-play and approaching $400 million in revenue and has generated a healthy competitive scene as well; Hearthstone has awarded over $11 million annually in cash prizes, and the 2018 world champion Chen Wei-Lin (Taiwan) was awarded a cash prize of $250,000. Like Magic: The Gathering, Hearthstone is an international phenomena with a current top 10 player list hailing from 7 different countries (Czech, Russia, United States, Germany, Sweden, Taiwan, Denmark). The streaming outlet Twitch has been a key component to the game's success as an esport, as competitive players such as Trump report earning over $100,000 annually from subscriptions, advertising, and coaching.

The existence of competitive play with relatively stable players—with impressive money purses attached—suggests the competitive cognitive achievement to *Hearthstone* success. Whereas most competitive games are action games that rely more heavily on reaction times and physical movements, CCGs are turn-based, and therefore less dependent upon reaction time or precise mouse and keyboard movements. Although Hearthstone involves significant management of randomness (in terms of both which cards are drawn and the effects of particular cards) the list of Hearthstone champions is remarkably consistent and points to the knowledge and skill involved in competitive play. Players such as Kolento, Firebat, Trump (no relation), and Pavel appear time and time again in top ranks. With millions of players playing and 100,000s playing in competitions, the consistent success of particular players suggests that successful play is not random.

This paper examines Hearthstone in depth, asking, "What is the nature of Hearthstone expertise, and if it is a game system recruiting expertise, what kind of an expertise is it?" Consistent with the Well Played series more generally it seeks to unpack and communicate the experience of playing and learning Hearthstone, with a particular emphasis on the interplay among mastery of the game as a system, understanding how expertise forms, and the dynamic interplay among strategies. In addition to suggesting how such cognitive activity operates in *Hearthstone*, it seeks to document the ever-evolving ecology of cognitive resources that support play.

We argue that a core pleasure of Hearthstone is how it manages randomness and has made a competitive, skill-based game out of probabilities. Succeeding in Hearthstone requires mastering it as a semiotic system, understanding it as a system of probabilities (including the probabilities of your opponents overall goals and specific strategies), and then countering those moves with superior plays. Both the moment to moment gameplay and the overall game aesthetic is about making predictions based on knowledge of the system and probabilities ("What is my opponent trying to do here, what is my most likely next card"). The fact that Hearthstone has made a competitive game out of a dynamic that at its heart may seem counter to competitive play is an achievement. Educators in particular might take note of how Blizzard built a game around a concept notoriously difficult to engender in students.

PLAYERS AND METHOD

This paper builds on thousands of hours of gameplay across all three player-authors (as advised by Davidson, 2005). Each author plays Hearthstone competitively and typically places within the top 5% of players for the season, although each author has slightly different play styles, preferences, and history. Two of the authors have been playing since its release in 2014 with a

third joining in 2016. At different times, we have all played with different goals (from Arena, to competitive ladder play to unlocking "golden heroes," to constructing personally satisfying or unusual decks). This paper is the result of extended formal and informal discussions over this period, both face-to-face and through various channels (email, in game). Consistent with the Well Played format more generally, this paper proposal examines typical learning trajectories and observations on patterns of play, and is intended to make claims and generate theoretical models that others in the community may support, refute or challenge.

INTRODUCING HEARTHSTONE

Hearthstone is a card-based game played between two players in a turn-based format (see figure 1). Players meet at a table-top themed battleground as a selected class with a self-constructed deck of 30 cards. There are 9 classes to choose from, and each has their own unique abilities, playstyles and class specific cards (e.g., shamans use elemental spells and can summon totems; paladins cast buffs on their minions to make them stronger and give them special abilities; mages summon minions with unique abilities and can protect themselves from fatal damage with spells). Each hero is taken from the Warcraft universe and play on Warcraft lore (indeed the game itself is supposedly played in Warcraft taverns), although the game is also developing its own unique lore as well.

Figure 1. The digital tabletop battlefield. Players face each other and play minions and spells to affect the board state. The player's hand is at the bottom of the screen. Actions that can be taken are highlighted with a green border (e.g., playing cards or using a class hero power)

Each hero is designed to have a unique *playstyle* and *feel*. This playstyle is derived from 1) their "hero power," 2) class specific cards that tend to create particular kinds of interactions, and 3) the interactions of these elements that create archetypal decks. The hero power is a unique skill (i.e. hunters can do two damage to the opponent's hero, priests can heal any character for 2

points). Class specific cards reinforce certain styles of play, such as the rogue's "combo cards" which unlock new abilities when cards are played in combination. Finally, the combination of cards are designed to create an overall aesthetic "feel" to the character. For example, the aggressive (or aggro) hunter is designed to feel like a relentless attack on opponents, whereas a control priest is intended to feel like a defensive-oriented maestro that uses unique card combinations to stave off opponents before outlasting them. The warlock, which does damage to itself in order to draw cards is emblematic of the odd ways that cards interact as it frequently involves the player inflicting "self-abuse" to unlock special cards or abilities than then enable the player to concoct a miraculous victory.

Players craft a deck from their unique class cards and a pool of neutral cards common to all classes. Cards come in mainly two types: **minions** and **spells** (there are some specialty types, but for this paper we focus on only these two). Minions—elves, orcs, humans, kobolds, beasts, monsters, gods—are placed on the digital tabletop battlefield when they are "played." Minions can attack other minions as well as the opposing hero. Minions have health points like a hero, and will be destroyed when their health reaches zero. Spells can be cast to do things like draw cards from your deck, deal damage to minions and heroes, and buff up, weaken, or even transform minions. Players use combinations of minions and spells to affect the battleground and reduce the opposing player's health points to zero.

THE MATCH

Players begin a match with 30 health points and when a player's health points reach zero they lose. Players start by drawing a handful of cards and begin the game with a single mana crystal—a resource used to play cards. Every turn a player adds 1 mana crystal to their mana pool until they reach a maximum of 10 mana crystals. On any turn, a player can spend their mana

crystals from their mana pool to play a number of cards. Each card is labeled with a mana cost. At the beginning of subsequent player turns, the mana crystals refresh so they can be spent again. Matches begin by the hero avatars automatically greeting each other; players are then able to send expressive emotes during matches such as, "Hail, and well met!", "Well Played." and "Your suffering shall be … Legendary." These emotes, while rudimentary, do enable interaction, and customs about how and when to use emotes have emerged, with them taking on a certain degree of meaning in context.

MANAGING PROBABILITY

Chance, or managing probability is central to Hearthstone, and to some degree, the game is *about* predicting and managing probabilities. Drawing cards in a random order from a deck represents the most common form of chance in any card game. Although a player never knows what card will next be drawn from the deck (or the opponent's), game play is a constant process of making probably predictions on what those cards might be. For example, a very common card in the priest deck is the Northshire Cleric (shown right). Although it does not have especially powerful statistics, its special ability (enabling the player to draw a card whenever another minion is healed) *is* powerful, as it can be used to draw multiple cards early in the game. When playing a priest, it is common to "play around" this card, by anticipating its play and looking for cards or card combinations that can remove it from play. Thus, players manage chance by including cards in their own deck that are able to deal with this important early game threat.

Northshire Cleric

Whenever a minion is healed, draw a card.

As a digital game, Hearthstone has the ability to integrate chance and randomness in ways that are difficult in analog games. For example, generating a random random card or casting an effect onto a random target is difficult (although doable) in an analog game, but relatively trivial in a digital one. Through time,

Blizzard has included less truly random mechanics and instead integrated *choice* and *randomness*, so that a card may display 3 randomly generated choices for the player to choose from, which keeps each game unique and fresh while also making each choice more about skill (knowing which selection is strategically best) rather than simply chance. This interaction of randomness and choice has the second benefit of rewarding *situational knowledge*; choosing a good card in context requires understanding a player's goals, the other player's goals, and the overall situational awareness, rather than simply selecting a card based on its strength.

Single chance effects play an essential role in gameplay motivation and strategy development. Random chance ensures that matches between players are not rigidly predictable. The dynamics of chance interact with motivational competency and feelings of novelty. No player can master the fate of chance, which makes complete mastery in Hearthstone an evergreen challenge. For the newcomer, chance supports underdog plays and helps them learn while having fun. The chance mechanic maintains the flow theory channel between boredom and anxiety (Csikszentmihalyi, 1990). Without Hearthstone's level of chance, gameplay would get stale more quickly and lead to frustratingly hard matches for learning players.

Strategic players will need to take into consideration the probable, the unknown, and the near impossible. The space of play becomes a complex ill-structured problem that changes dramatically from match to match. The variance in play reduces the repetitiveness and widens the amount of working knowledge required to play successfully. Working towards mastery is a long process that feels rewarding when a player is able to predict the near impossible and beat their opponent. In the same vein, a crushing defeat from the unknown throws competency aside. The defeating emotion experienced from the unknown is valuable in providing variance in play. Hearthstone matches are

short and are not an ends all of player skill, the chance for excitement is balanced against strife.

WHY HEARTHSTONE FOR WELL PLAYED?

This work was inspired by Dan Norton's shared experiences with Magic The Gathering in Well Played entitled: "Magic The Gathering: A Learning Game Designer's Perspective" (2015). Hearthstone sits within the same genre as Magic and many of Norton's discussed relationships are equally meaningful here. This work aims to build on Norton's discussion about card game mechanics by leading it into Hearthstone's community activities. Hearthstone's activities predominantly use digital media to facilitate player development and interact with the game. YouTube, Twitch, Reddit, and fan-sites add a noteworthy level of game interaction into the Hearthstone experience.

The level of integration between community digital media and Hearthstone is indispensable; the game is measurably defined by the interactivity. Interweaving game design with digital media practices characterizes gameplay as a complex system and questions what players are doing and why they are doing it. This linkage creates a discussion about how game design mediates community development. The direction of this conversation helps designers become aware of how players act outside the game, but in direct reference to it. Likewise for educators, they can see how a game system and its players form knowledge communities around complex content, which can lead to new innovations in schooling and cognitive development. Essential Hearthstone knowledge is described next and then connected to the communities that form around it.

THE FIELD OF PLAY

A quick introduction into the Hearthstone field of play. A deck consists of 30 player selected cards. Both players automatically draw a card from their decks at the beginning of every turn. All

cards have a mana cost associated with them. The distribution of a deck's mana costs is called the **mana curve—**a bell shape is common. The player to go first starts with a hand of 3 cards. A player going second starts with 4 cards and a special 0-mana cost spell called the **coin**. When a player casts the coin spell, they generate 1 additional mana crystal that can be used for the given turn. The coin allows a player to play costly cards or multi-card combos turns earlier. The advantages of 1 additional mana and 1 extra card given to the second player account for the disadvantage of going second.

There are 3 phases to a match: **early**, **mid**, and **late game**. Early game plays are limited by the number of mana crystals available. Each player begins a match with a single mana crystal and gains another crystal at the beginning of subsequent turns. Hearthstone's resource mechanic mediates how players build their decks while also creating a paired resource between the players. Each player will be able to make similar strength plays as turns pass. Deck building needs to consider the mana cost of each card as well as the number of cards in the deck that have that cost. A deck with too many high cost cards will not be able to make early plays, which can lead to being overrun. A deck with too many low cost cards might lose as the gameplay transitions phases and the opposing deck starts playing both high cost and power cards. Playing cards that cost the same number of mana crystals available is called **playing on curve.** Stronger cards have higher mana costs, so playing on curve is associated with making the strongest possible play. Mid and late game plays have more mana crystals available, which allows multi-card combos and costly cards that dramatically affect the battleground. Beginning on the 10th turn, 10 mana crystals can be spent to play combinations of cards that have game ending effects when played concurrently.

HOW, WHEN, AND WHY TO PLAY CARDS

When a card is played, it can be assessed for **tempo** or for **value**. Playing for tempo means that out of all plays currently possible, the player is making a play to maximize damage—even if its 1 damage or 15—it's whatever pushes the most damage. Tempo plays need to be countered by the opponent immediately or can lead to a loss. Tempo introduces the concept of **trading**. Trading means that a player uses a combination of spells and minions to counter a tempo play made by their opponent. Players need to determine whether countering an opponents play is correct. If an opponent's tempo play is weak, then by trading with it a player risks losing the match. Decks are limited in resources and inefficiently playing resources can only lead to one result—defeat. Playing for value means that the player is generating additional cards (randomly or from their deck) or is organizing a future tempo play. The key difference in a value play, is that no response is needed by an opponent. A value play minimizes the current turn's damage potential for later damage in some future turn.

The key terms introduced create the basic dynamic of play. As players become fluent in these actions, they begin to master the most demanding aspect of the game—understanding a matchup. A matchup is the comparison of cards and possible actions between opposing players' decks. When thinking of matchups in Hearthstone, many competitive players refer to "Who's The Beatdown?" by Mike Flores, a long-time professional Magic player and strategy writer (Flores, 1999). In the Flores framework, a player is termed the beatdown when their deck affords the ability to deal more damage to minions on the board and the opposing player—a tempo dominant playstyle. A player is labeled control if they have more options to prevent damage, counter plays, and stall the game than the opposing player—a value centric playstyle.

There is more to this conversation than these two labels, but it presents a good starting point. The beatdown deck is going to rely heavily on tempo and optimize damage output per turn, while the control deck wants to optimize counter plays with a mix of value and tempo. A note on tempo plays made by a control player. Since tempo needs to be countered or can lead to a loss, a control player can make a tempo play to behave as a counter play. If the tempo play is strong enough, the beatdown player is forced to deal with the situation or risk a loss. In this case, the strength of a counter play is determined by the difference in the tempo play between control and beatdown.

CAN YOU SHOW ME THE WAY?

Players have adopted the roles of teacher, mentor, and guide for essential Hearthstone knowledge. A well-known introductory digital media series is called Trump Teachings. The series introduces concepts of gameplay and discusses the technical aspects to matchups. The series is made by Trump, a professional Hearthstone player, who creates digital media on YouTube (800k+ subscribers) and streams live gameplay with commentary on Twitch (800k+ followers). Trump is one of many who create such media on both YouTube and Twitch. Other resources include websites with writers and analysts that create learning material: What's the Move? (see Figure 2), matchup guides by the week (see Tempo Storm in references), and specific card play statistics (see HSReplay in references). *What's the Move* dissects a single turn in a Hearthstone match that involves intricate thinking about value, tempo, and counter plays. *Matchup guides* discuss core deck strategies, logic behind card selection, optimal plays to look out for, and how a deck plays against others. For *play statistics,* a number of sites use data from ~180k Hearthstone (at the time of writing this paper) players to assess gameplay through metrics, global patterns, and recordings of games between players. Analytics inform player discussion and motivate a deeper involvement in learning how to play optimally.

Hearthstone communities and content are diverse and often tailored to particular aspects of the game. Three communities will be described: casual, arena, and ranked.

Figure 2. *"What's the Move?" instructional series sets up a situation for players and discusses various options of gameplay. In this case, three different play sequences are labeled with a number and described. The audience is given 30 seconds to decide which play they would choose and why. After the reflection time has ended, the video discusses at length the play options and explains which play is the strongest given the context of the match.*

CASUALS

Joining the casual clan is a way of engaging with the game that is based on fun, experimentation, and discovery. A casual's goal is not always to win, or make the highest level decisions, but to connect with others by *playing* through interesting mechanics. Hearthpwn.com is a deck sharing platform serving Hearthstone's diverse player base, but also supports the largest community of casuals who share decklists and strategies. A critical aspect to this mode of play is that casuals typically make their own decks or test personally modified versions of a deck. Casual play contrasts with competitive play, where netdecking norms result in near exact copies of high performing decks. Personally crafted decks use different cards than what players are used to but rely

on the same game mechanics. This difference in play structure translates into a difference in how the game mechanics are cognitively represented through the cards (Turkay, Adinolf & Tirthali, 2012). The specific player chosen cards have uncommon playstyles, mana costs, and game states. The shifting context takes the complexity of tempo and value and frames the problem into a varied representation, giving the learner another angle to understand complex mechanics (Cunningham & Duffy, 1996; Hannafin & Land 1997). Here casual players can see game sequences of tempo and value under various conditions and refine their knowledge about the game.

ARENA CHAMPIONS

Nothing like a bit of money on the line to get the blood pumping. Arena is a guild of players that draft their decks from random selections of cards and then compete against each other to demonstrate drafting knowledge and skill to process unpredictable situations. In order to participate in arena, a player buys an in-game entry ticket using the in-game currency. For every match the player wins, a counter on the ticket increases by one. Once the ticket reaches twelve wins, the player is showered in valuable rewards. If a player receives a total of three losses at any point, the arena run is over and the player is rewarded based on the number of wins achieved. After an arena ticket is purchased, the deck drafting process begins. During a draft, a player is shown three random Hearthstone cards and is allowed to pick one to add to their deck. The three to one drafting process is repeated until the player has a 30-card deck. Part of the arena experience is luck, and some player drafts result in decks with higher quality cards than other players.

Drafting a 30-card deck is very complex. A successful deck needs an appropriate mana curve based on the chosen cards, a cohesive beatdown or control plan, and synergies to make strong tempo | value plays. In order for players to learn Hearthstone's complex

systems, they need to make core concepts explicit, collaborate in socially relevant gameplay, test their mental models, and continuously observe the game in various contexts (Jacobson et al., 1999). Scaffolding is deeply connected in this process, where learners are on the boundary of their knowledge and need support from peers and experienced players to reach new levels of performance (Vygotsky, 1978). The Hearthstone community highlights exactly this interplay between knowledge bearers, the interactive media they create, and inexperienced players participating with those content creators and developing their own negotiated meanings.

External game communities are not often the focus of game design but imperative in understanding the gameplay itself. In these communal affinity spaces, players are mutually engaged in complex and diverse activities, working towards a collective negotiated meaning, with a shared repertoire of tools, practices, words, stories, and concepts—forming a community of practice (Lave & Wenger, 1998). Key contributors to the arena community are Adwcta and Merps, who produce multi-hour digital media on YouTube that discusses a drafting process and the subsequent arena run. A common practice among arena content producers is to use Twitch while recording the video for a YouTube upload. During a Twitch stream, the audience—many of whom are Hearthstone players—ask questions about the draft picks and matchup strategies. TheLightForge.com, maintained by Adwcta and Merps, is a list of all draftable cards available to arena players and can be organized by various filters. Arena players use this tool to support their understandings when drafting a deck.

RANKED PLAY AND BECOMING LEGEND

Reaching a high rank in Hearthstone takes hundreds of matches and is an ultimate showcasing of skill, knowledge, flexibility, and commitment. At the end of every month, a season of ranked

play ends and all players' ranks are reset for the next seasonal month. There are 25 ranks in Hearthstone and moving down the ladder to rank 1 is the challenge. Beating the best of the ranked 1 players is rewarded with the status of Legend—a feat 0.5% of players accomplish every season (Zeriyah, 2014). Every win on ladder increases the quality and experience of the opponents a player faces. With both experience and understanding high among players, a single error can result in a complete loss.

Many professional players produce live streams on Twitch and digital media for YouTube. The content has the same scope mentioned with *Trump Teachings*—they examine game states, discuss the complexity of plays, and interact with their audience. Pros also interact with each other in this medium by remixing deck ideas and sharing their experiences. The professional side of the community practices a component of knowledge building, where players collaborate and produce epistemic artifacts—streams, videos, tools, guides—that lead to the creation of newer knowledge (Scardamalia & Bereiter, 2006). The audience side behaves as a community of learners, interacting with these artifacts and taking part in apprenticeship from pros, leadership in teaching other players and friends, navigating the breadth of support, and continually reflecting on and discussing the differences between their plays and the pros (Rogoff, 1994). The player FenoHS organizes a popular series on Twitch. In the multi-hour stream, professional players stage a best of 11 matchup. Two players take control of the decks and a sideline of pros discuss and breakdown the matches. Alongside the experienced commentary, audience members ask questions, suggest alternative plays, and reflect. Cognitive articulation is not directly transferred into the heads of the eager players, but they can makes their own play comparisons, challenge the pros' actions, and reflect on the information to construct personal meaning (Jonassen & Rohrer-Murphy, 1999). Actively working through problem states and reflecting on them is a well

recognized component to many learning pedagogies. The community, year over year, is developing rich resources and connecting its players to each other.

UNDERSTANDING GAMES

Mainstream gaming culture has been growing steadily over the decades. What we play now is fundamentally different from what we started off playing. The rising design patterns in complexity, depth, and sociability can transform a singular and tangential play session into a life's purpose. Ok, maybe we don't all dedicate our lives to games, but engaging with them in a serious manner is increasingly common. Performing in and contributing to today's games requires high levels of competence and cognitive development—involving hours of study, planning, and persistence.

The idea of the gamer life is nothing new, *chess* and *go* are two examples that have been around for centuries. In these historic games, players have dedicated lifetimes of practice and learning to demonstrate a public mastery over an ill-structured problem space. In fact, the rise of such master chess players inspired years of technology research in developing artificial intelligence to beat them—a superhuman challenge. This Well Played Hearthstone exposition motivates a critical concept that should guide how we think of game design and envision the player. Steinkuehler (2006) succinctly and powerfully captures this concept in a brief piece:

"Games are designed experiences (Squire, 2005), and as such, their study requires an understanding of the full range of human practices through which players actively inhabit those worlds of rules and texts and render them meaningful. Games are a "mangle" (Pickering, 1995) of production and consumption—of human intentions (with designers and players in conversation with one another; Robison, in press), material constraints and affordances, evolving socio-cultural practices, and brute chance.

Whereas rules and stories partially constitute the designed object or little g game at the center of a given individual's play experience with it, it is the emergent culture or big G Game around them that renders them meaningful and consequential (Games and Professional Practice Simulations Research Group, 2005; Gee, 1999; Shaffer, in press; Squire, 2002; Steinkuehler, 2005)."

The Hearthstone player communities and activities depicted here paint a passionate reality of g/Games. The little g game of Hearthstone is found in the cards themselves and how players navigate matchups and choices. Players play cards to interact with other mechanics and seek victory through mastery. The big G game is found in the rich material that enrobes the entire context of Hearthstone. Meeting and networking with players, building decks, learning in all manner of spaces and places, organizing public forums, negotiating meaning, and defining what it means to belong to the Hearthstone community.

REFERENCES

Blizzard Entertainment. (2014). Hearthstone [computer & mobile video game]. Irvine, CA.

Csikszentmihalyi, M. 1990. Flow: The psychology of optimal experience, New York: Harper & Row.

Cunningham, D., & Duffy, T. (1996). Constructivism: Implications for the design and delivery of instruction. Handbook of research for educational communications and technology, 51, 170-198.

Davidson, D. (2005). Plotting the Story and Interactivity of the Prince of Persia: The Sands of Time. Delivered at the Media in Transition 4, MIT, Cambridge, MA. 12.

Flores, M. (1999). Who's The Beatdown? Retrieved January 19,

2018, from http://www.starcitygames.com/magic/fundamentals/3692_Whos_The_Beatdown.html

Hannafin, M. J., & Land, S. M. (1997). The foundations and assumptions of technology-enhanced student-centered learning environments. Instructional science, 25(3), 167-202.

Jacobson, M., Kaput, J., Bar-Yam, Y., Jakobsson, E., Lemke, J., & Wilensky, U. (1999). Complex systems and education: Cognitive, learning, and pedagogical perspectives. Planning Documents for a National Initiative on Complex Systems in K-16 Education.

Jonassen, D. H., & Rohrer-Murphy, L. (1999). Activity theory as a framework for designing constructivist learning environments. Educational Technology Research and Development, 47(1), 61-79.

Lave, J., & Wenger, E. (1998). Communities of practice. Retrieved June, 9, 2008.

Marinconz, S. (2014). Here's How Rare Hearthstone Cards Actually Are. Kotaku.com. Available at: https://kotaku.com/here-are-the-actual-hearthstone-legendary-card-drop-rat-1586156518[Accessed 23 Jan. 2018].

Norton, Dan (2015). Magic The Gathering: A learning game designer's perspective. Well Played—Vol. 4, No. 1, 193-205

Rogoff, B. (1994). Developing understanding of the idea of communities of learners. Mind, culture, and activity, 1(4), 209-229.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. Contemporary educational psychology, 25(1), 54-67.

Scardamalia, M., & Bereiter, C. (2006). Knowledge building. The Cambridge.

Steinkuehler, C. A. (2006). Why game (culture) studies now?. Games and Culture, 1(1), 97-102.

Turkay, S., Adinolf, S., & Tirthali, D. (2012). Collectible card games as learning tools. *Procedia-Social and Behavioral Sciences*, *46*, 3701-3705.

Vygotsky, L. S. (1978). Mind in society: The development of higher mental process.

Zeriyah. (2014). Hearthside Chat – You're Better Than You Think! Retrieved January 19, 2018, from https://playhearthstone.com/en-us/blog/15955974/hearthside-chat-youre-better-than-you-think-9-18-2014

MEDIA LINKS

Trump Teachings (YouTube content series). https://www.youtube.com/watch?v=2KjtRokhpvM&list=PLvEIxIeBRKSjprrvlbAcbVjzHsnH9PjDX

What's the move? (YouTube content series).https://www.icy-veins.com/forums/topic/35396-whats-the-move-13-a-beginner-friendly-episode/

Tempo Storm. https://tempostorm.com/hearthstone/meta-snapshot

HSreplay. https://hsreplay.net/meta/

Hearthpwn. http://www.hearthpwn.com/

TheLightForge. http://thelightforge.com/TierList

ABOUT THE AUTHORS

Ann DeMarle
Emergent Media Center
Champlain College
246 South Willard Street
Burlington, VT 05401
demarle@champlain.edu

Dr. Jodi Asbell-Clarke
EdGE at TERC
2067 Massachusetts Avenue,
Cambridge MA 02140
jodi_asbell-clarke@terc.edu

David Libby
TERC
2067 Massachusetts Avenue,
Cambridge MA 02140
david_libby@terc.edu

Gabriele Aroni
Ryerson University
gabriele.aroni@ryerson.ca

Hua Wang
University at Buffalo
The State University of New York
359 Baldy Hall

Buffalo, NY 14260
hwang23@buffalo.edu

Ji Hye Choi
University at Buffalo
The State University of New York
359 Baldy Hall
Buffalo, NY 14260
jihyecho@buffalo.edu

Kurt Squire
UCI
ksquire@uci.edu

Mike Tissenbaum
MIT
miketissenbaum@gmail.com

Nicholas Persa
UCI
npersa@uci.edu

Peter Stidwill
FableVision Studios
308 Congress St., 6th floor
Boston, MA 02210
peters@fablevision.com

Sarah Ditkoff
FableVision Studios
308 Congress St., 6th floor,
Boston, MA 02210
sarah@fablevision.com

Scot Osterweil
Learning Games Network
369 Congress St.

Boston, Massachusetts 02210
scot@learninggamesnetwork.com

Yishin Wu
University at Buffalo
The State University of New York
359 Baldy Hall
Buffalo, NY 14260
yishinwu@buffalo.edu

ABOUT ETC PRESS

The ETC Press was founded in 2005 under the direction of Dr. Drew Davidson, the Director of Carnegie Mellon University's Entertainment Technology Center (ETC), as an open access, digital-first publishing house.

What does all that mean?

The ETC Press publishes three types of work:peer-reviewed work (research-based books, textbooks, academic journals, conference proceedings), general audience work (trade nonfiction, singles, Well Played singles), and research and white papers

The common tie for all of these is a focus on issues related to entertainment technologies as they are applied across a variety of fields.

Our authors come from a range of backgrounds. Some are traditional academics. Some are practitioners. And some work in between. What ties them all together is their ability to write about the impact of emerging technologies and its significance in society.

To distinguish our books, the ETC Press has five imprints:

- **ETC Press:** our traditional academic and peer-reviewed publications;

- **ETC Press: Single:** our short "why it matters" books that are roughly 8,000-25,000 words;

- **ETC Press: Signature:** our special projects, trade books, and other curated works that exemplify the best work being done;

- **ETC Press: Report:** our white papers and reports produced by practitioners or academic researchers working in conjunction with partners; and

- **ETC Press: Student:** our work with undergraduate and graduate students

In keeping with that mission, the ETC Press uses emerging technologies to design all of our books and Lulu, an on-demand publisher, to distribute our e-books and print books through all the major retail chains, such as Amazon, Barnes & Noble, Kobo, and Apple, and we work with The Game Crafter to produce tabletop games.

We don't carry an inventory ourselves. Instead, each print book is created when somebody buys a copy.

Since the ETC Press is an open-access publisher, every book, journal, and proceeding is available as a free download. We're most interested in the sharing and spreading of ideas. We also have an agreement with the Association for Computing Machinery (ACM) to list ETC Press publications in the ACM Digital Library.

Authors retain ownership of their intellectual property. We release all of our books, journals, and proceedings under one of two Creative Commons licenses:

- **Attribution-NoDerivativeWorks-NonCommercial:** This license allows for published works to remain intact, but versions can be created; or

- **Attribution-NonCommercial-ShareAlike:** This license

allows for authors to retain editorial control of their creations while also encouraging readers to collaboratively rewrite content.

This is definitely an experiment in the notion of publishing, and we invite people to participate. We are exploring what it means to "publish" across multiple media and multiple versions. We believe this is the future of publication, bridging virtual and physical media with fluid versions of publications as well as enabling the creative blurring of what constitutes reading and writing.