KATRYNA STARKS (http://orcid.org/0000-0001-8888-5015)

Dr. Katryna Starks is a game scholar and researcher specializing in curriculum development, training, narrative, and psychology. Her research focuses on how video games can foster health-promoting behaviors, how female protagonist agency affects youth and young adult female player identity. She co-developed a Bachelor of Serious Games degree and designed the Interactive Narrative minor within that program. Her most prominent research includes "Cognitive Behavioral Game Design: a framework for creating Serious Games", and "Using Twine as a Therapeutic Writing Tool for Creating Serious Games". In her teaching, she loves creating showcasing engaging stories, whimsical characters, and conveying worlds through simple interactions that convey meaning.

GUIDELINES FOR LUDONARRATIVE CONVERSION:

A CASE STUDY FOR A CHILDREN'S BOOK CONVERTED TO A GAME

KATRYNA STARKS

University of Illinois at Urbana-Champaign

Abstract

Video games are a way to help children improve their communication and collaboration skills as well as engage them in the world of their favorite book characters. This paper explains the unique features of books and games, and how interactivity can enhance the reader experience in the game world. It then goes on to explain various design considerations for children, including age ratings and designs for screen time recommendations. Further, game mechanics are paired with Erickson's stages of development to facilitate optimal design in various age group. Finally, a development framework is presented, and a case study features a prototype design which displays these principles in a real-world setting.

Keywords: play, games, books, children's literature, children's video games, narratology, ludology, ludonarrative

Introduction

According to the Entertainment Software Association (2022), video games are among the most popular activities among American children, with 71% of children playing them (ESA, 2022). And, games are a family affair, with 77% of parents reporting that they play them with their children at least once a week. The report indicates that games bring out the creative side of players, and help children learn to manage their emotions while they win, and when they lose. Further, players responded that games are beneficial in several areas, including communication and leadership skills as well as teamwork and collaboration. Players often play games on more than one device, with the most prominent being their phone (70%), however they also play on PC devices, tablets and consoles.

Though much literature on games for children focuses on educational games, children can and do benefit from playing entertainment games. In a study of 112 children ages 4-12 who were waiting in preparation for surgery, those who played a video game had decreased anxiety before being prepared for anesthesia than those who received parental support without a game (Patel, et al, 2006). Further, their preoperative anxiety levels did not significantly differ from those who took Midazolam, which calms anxiety and induces sleep (Patel, et al, 2006). Even without highly stressful situations, such as surgery, video games help children persist through failure via activities such as puzzles and simulations (Lieberman, Fisk & Biely, 2009). Games also provide success experiences, which further increase child wellbeing. Providing a correct solution or winning a level and moving forward can enhance their self-images and increase their willingness to learn (Bandura, 1997).

Due to the popularity of games, children's book authors may desire to expand the ways in which young readers interface with their material by requesting book-based games, however designers of games for older audiences may not understand the unique considerations that accompany games created for children. The focus of this paper is to move toward a design framework that helps game developers create child-appropriate book-based games that function at the appropriate target ages for the books.

This paper begins with an overview of narrative and games and how they intersect, then moves through the features of books that are convertible to gameplay, suggests game mechanics based on children's stages of development, moves through design considerations for converting children's books to games, and finally, presents a case study in which these parameters are incorporated into a book-to-game conversion.

Background: Characteristics of Books vs Games

When transforming books to games it is important to maintain ludonarrative balance (figure 1). Ludonarrative is similar to the literary-ludic continuum, with a few slight differences. The term literary-ludic prioritizes the literary and moves toward the ludic. Ludonarrative is the term preferred by game developers, and places the ludo (play) element before the narrative. As such, when perfect balance cannot be attained, it is often considered better to emphasize gameplay over story.

Common elements of story include characters, settings, plot, theme, and resolution, and are separated by story beats or

chapters. Stories are expected to evoke an emotion from the reader, however they largely consist of texts. When considering illustrated works, the graphics contain the same elements as texts in they follow characters, plot, and theme. However, whether books are text, illustrated, or contain interactive elements such as pop-up books, they are generally static. Each reading of the story is the same from beginning to end, with the changes experienced being a result of experiential changes in the reader. Between the opening and the closing of the book, the characters may grow. Between readings, the reader may grow.

Games, however, are inherently dynamic. Instead of chapters, which are read and then often left behind as the reader moves to the next one, games have levels, which can be won or failed, causing many repeats. However, repeating a level may be a different experience than playing it the first time. Beyond mere levels, the entire game has a goal which often results in a score. Games include rules, which constrain their players, however the rules only provide a frame for actual play, often including instructions for variations. Books provide no variations, with the plot-frame being filled with the exact same words every readthrough.

Figure 1
Ludonarrative Balance

Books and games both provoke emotions, but the process and results differ. Books provoke empathy through the viewing of another life during one or several specific incidents and time periods. The reader may mentally wish the character made different decisions throughout the story, but there is no agency over that life in literature. There is no opportunity to avoid pain, make different friends, or choose a different path, down a different street. As such, there is no success or failure other than whether the reader finishes the book. If a reader finds a book particularly satisfying, they may choose to read it again. However, if the book did not end to the reader's satisfaction, there is often no reason to read it again. It will end the same way.

Games, however, allow the player agency over the character (which is sometimes the player), and therefore responsibility for choices made in the game. Rather than simply evaluating the choices a character makes, the player actually makes them. Farber & Erekson (2023) note that this sense of agency not only results in player choice, but also in player maturity as they tackle ethical dilemmas on behalf of the player, player empathy through exploration of choice and the failure that sometimes results, player healing as they learn to process emotional difficulties without real-life ramifications, and cultural expansion as they explore other worlds, languages, and lives (Farber & Erekson, 2023). While this type of experience can, and does, occur through books, games can express these insights through a 10-15 minute experience whereas it may take hours to get those elements from a book (Farber & Erekson, 2023).

Methodology: An Exploration of Design Considerations For Children

Developing games requires several components: concept, design, market research, determining genre, etc., however, when developing games for children, there are extra considerations. Screen time recommendations, maturity considerations, and age ratings are essential to understand. Children's entertainment includes well-established franchises as well, and IP licensing may be involved if games are adapted from other works.

Screen Time

Young brains are in a constant state of development, and care must be taken when creating and exposing them to media. According to the American Academy of Child & Adolescent Psychiatry (2020), children aged 8-12 years spend 4-6 hours using screens, while adolescents spend up to 9 hours. While educational media can be helpful, too much screen time can have detrimental effects such as obesity, sleep impairment, academic difficulties, and behavioral problems, (Christensen, 2021; Luker, 2022) as well as physical difficulties like eye strain and problems with posture, including neck and back pain (Luker, 2022) Furthermore, impressionable young people may find the dopamine rush of playing video games to be engaging and entertaining, however too much of it can lead to hyperarousal, which has detrimental effects on attention span, mood, empathy, and the immune system (Luker, 2022).

Regulatory bodies have provided guidance on screen time limits for children. Screen time is generally not recommended for ages below 2, with exceptions made for family video

calls (AACAP, 2020; Christensen, 2021; Stanek, 2023). Recommendations for ages 2-5 limit screen time to one hour a day (AACAP, 2020; Christensen, 2021; Stanek, 2023), allowing up to 3 hours on weekends (AACAP, 2020). Screen time for older children does not include strict time limitations, but families are encouraged to make informed decisions about limiting screen time within their households (AACAP, 2020; Christensen, 2021; Stanek, 2023).

Further, the guidelines pertain to all screens, including television, online calls, and video games. When observing that video game screen time must fit within the daily hour guidelines and observing that parents often limit their children's time on video games to 15-20 minutes, Parkash (Parkash, 2022) suggests that designers create games that are either 15 minutes in their entirety, or that are designed for play in 15 minute sessions, using break panels or cut-scenes to end the level and give the player a stopping point to leave the game.

Game design for limited screen time is best summed up with Jesper Juul's recommendations for casual game design (Juul, 2010). Casual games are meant to be played in small bursts of time and include repetition and scaled difficulty such that the player can stop playing the game and return hours or days later, easily resuming where they left off. While casual games are not a child-specific genre, the design rules can be helpful for creating child-centered games. Juul's parameters are: fiction, usability, interruptibility, difficulty, and juiciness.

Fiction refers to the game world itself and the stories contained within it. Juul (2010) recommends pleasant settings and de-emphasizes danger and horror. When designing a children's game based on a children's horror book, it is important to maintain the light levels of horrors in the book (ghosts and monsters, but not blood and gore) and to minimize or exclude high-scare elements such as jump scares.

Juul's usability refers to the way the user interacts with the game. High usability games are intuitive to learn, though tutorials should still be provided. Once beyond the first level, the game controls should be simple enough to learn, remember, and return to. This is not necessarily the time to add innovative controls that don't match with the interaction standards of the genre. Dragging, tapping, etc. should have predictable results. They should do what the average user would expect. In addition to simple controls, Juul suggests a simple interface as well. For instance, while the entire game world may encompass several locations, each game level should be constrained to a single screen. For example, if a game takes place in a home, a park, and a school, then levels might take place in the kitchen, the living room, the playground, a classroom, etc. In keeping with suggested screen time limitations, those levels could stop and split to a comic screen or narrative screen that players will manually click to move on with the game rather than moving to the next level automatically.

Difficulty refers to properly scaling the level of challenge throughout the game. Juul emphasizes that casual games should not only be easy to learn, but that difficulty should grow appropriately with the player. This concept is also known as Csikszentmihalyi's theory of flow, in which challenges and difficulties scale so that the player has a constant feeling of accomplishment, often losing track of time (Csikszentmihalyi

& LeFevre, 1989). While this design trait seems optimal from a designer's perspective, one of the principles in designing for children is that the player does not play continuously for hours. As such, this author recommends that a full flow state is not designed into the game, and that satisfying difficulty waves crescendo into full difficulty before a story break, which may encourage the player to stop playing and take a break every few levels. After the break, the levels can begin again with lower difficulty and then scale to encourage players to play until the next break. This sequence would provide flow waves and then breaks.

Juul's principle of juiciness refers to the decorative elements of games. Specifically, elements that make games look shiny and feel responsive. For children's games, one might expect cartoonish characters and objects, however juiciness would add sparkles to clicks and mouseovers, and soundscapes that harken back to children's cartoon antics. In games, this would translate to bounces upon collision, magical sounds when elements are collected, and sparkles that lead the player to a goal.

Age Ratings

While books don't have a regulatory body that certifies a recommended age range, games are governed by the Entertainment Software Ratings Board (ESRB) in the US and Pan European Game Information in Europe. Both organizations publish guidelines on content appropriateness for various ages, and provide labels to indicate age-related categories. The ESRB includes distinctions between audiences under (E) and over age

10 (E10+), and guidelines separating younger teens (T) from older teens (M), and adults (A). Games that are yet to be rated have two categories, rating pending (RP) and rating pending likely mature (ESRB). This helps ensure that mature content that has yet to be specifically rated will be handled with appropriate caution. The ratings cover topics such as alcohol and drug references, blood and gore, and gambling, as well as 'milder' topics such as bathroom humor (crude humor), fantasy violence, and slapstick (comic mischief). Violence is differentiated by whether it is against fantastical creatures (fantasy violence) or humans (intense violence). The ESRB also labels games according to potential financial and emotional vulnerabilities. For instance, game ratings labels include whether the games include in-app purchases, user interactions, and whether the game indicates the player's location.

PEGI ratings are similar to the ESRB, with a few notable differences. The labels are numbered rather than use letters, which indicate more specificity with regards to age (PEGI). For instance, labels include 3, 7, 12, 16, and 18, implying that the content is suitable for people over the age on the label. PEGI ratings include information about violence, gambling, drugs, and in-app purchases, but also more abstract concepts. Warnings are included if the game contains fearful elements, bad language, and/or depictions of stereotypes and discrimination.

Game labels are not required on all stores, however they are prominently displayed when available. The ESA reports that 84% of parents in America are aware of ESRB ratings, while 75% of parents actively use them to monitor the games played by their children (ESA, 2022).

Game Mechanics and Child Development

When choosing mechanics for children's games, age group and maturity level are the main considerations. While it is easy to think of maturity level in terms of content, which is the basis for the age ratings discussed earlier, it is also important to consider screen time, motor skills, and developmental goals.

Due to the recommendations that children age 2 and under do not spend time on screens, this paper does not include mechanics for that age group. VR and XR guidelines for children are still being established, and therefore this paper does not assume design recommendations for those platforms. For the rest of the ages, the development reference will be the positive goals in Erikson's stages of development (Vogel-Scibilia, et al., 2009), namely the stages of Initiative, Industry, and Identity.

Ages 3-5—Initiative

In this stage of development, children want to go from observers to participants, demonstrating that they can do instead of just watch (Vogel-Scibilia, et al., 2009). The inherent interactivity of games over books can meet this need, but developers must take care to incorporate motor skills and content understanding when designing for this age. For instance, exploration is highly recommended, as is providing objects to move or assemble, and simple puzzles. However, there is no need for any sort of direct combat or any scoring system for these games. The escape room genre provides an example of non-scoring games, as the objective for these games is to solve puzzles, move between locations, and eventually complete the game. As of this writing, most escape room games

are too mature for this age group, however this style of game can use very simple hidden object and assembly puzzles for this group. Other genres and mechanics suitable for this age group are point-and-click games, which can generally use point-and-click mechanics for all types of interactivity in the game: exploration, object handling, and matching. While most children may not be reading or completing math problems at this age, games can introduce educational concepts like colors and shapes.

Ages 6-11—Industry

At ages 6-11, children move from initiative to industry, meaning they are aware of skill hierarchy and are concerned not just with the ability to perform actions, but to perform them well (Vogel-Scibilia, et al., 2009). When designing games for this stage, scores can be introduced so that players have a measurable goal to aspire to. Mathematical concepts can be used in other ways as well, for instance inventory, collection and resource management, including tycoon-style games where the player character manages a business. Due to better motor skills, more action elements are appropriate for this age, such as racing. This age group can also tolerate mild elements of competition.

Ages 12-18: Identity

Ages 12-18 include the teen years, and game mechanics for this age group largely resemble games created for adults. This age is characterized by a desire to build relationships with others as well as build their own identities through self-discovery (Vogel-Scibilia, et al., 2009). Bandura's social cognitive theory

of mass communication (Bandura, 2001) indicates that characters can provide behavior modeling, so games for this age group can be more character driven, with copious dialogue that allows players to understand character motives and analyze in-game character/npc relationships. Text adventures and visual novels provide these opportunities, as well as large, exploratory games such as farm sims. This age group can also handle more action and conflict, which includes sports games, RPG-style combat which typically involves diminishing health bars but no gore, and safe-shooters which include shooting water, bubbles, or paint rather than bullets. Online versions of traditional board games can provide age-appropriate ways of interacting with others online.

Translating Scenes to Mechanics

While reading books that will be translated to games, designers can match individual story elements to mechanics in order to obtain ludonarrative balance and in consideration of design budgets. While story elements such as characters, settings, conflict, and story beats are seamless in books, making these specific elements interactive requires knowledge of their roles in games, and the functions of the game development team for each element.

Table 1
Recommended game mechanics per age group and maturity

Ages 3-5: Initiative	Ages 6-11: Industry	Ages 12-18: Identity
exploration	racing/driving	text / dialogue
point-and-click	resource management	visual novel
puzzle and maze	inventory	board game simulation
platforming	cards	RPG-style combat
hidden object	collection	shooting with water, paint, bubbles, etc.
room escape	construction	sports emulation
tower defense	drag-and-drop	
simple matching and categorizing	business / tycoon sim	

Characters

The protagonist of the book is often the player character in the game, however the designer must consider whether the game will be in first-person perspective or third-person. This perspective is one of the first decisions that game designers will make, as it controls the entire design of the game. More importantly, the perspective of the book character does not have to match the game. A book written with a first-person perspective might be more appropriate with third-person gameplay and vice-versa. For younger players, or in games with underrepresented protagonists, third-person may be important for bolstering player self-esteem through identity, as the player can see a visual representation of the protagonist at all times.

Third-person perspective includes two popular ways of presenting games: over-the-shoulder (OTS) and top-down. OTS games are much like first-person games, only instead of a wide view of the scene, the games place the character in the scene and the player sees the character's back. The design similarity is that with first-person and OPS games, the player only sees what is in the protagonist's sight-range. In top-down games, the player looks over the entire scene and controls the character across a wide landscape.

Equally important are protagonist associates and background characters. Unlike books, almost all characters with dialogue in a game are also represented graphically, so game budget restrictions may require combining characters from the book, or dropping them altogether. Characters who do appear in the game may need to take on expanded roles. For instance, the characters who give the reader information about the story may expand their expository role to include tutorial information about how to solve puzzles.

Locations

Just as with characters, locations in games must appear visually, however there is another element to be considered. In games, characters go in and out of buildings, therefore designers will need to include interactive elements like opening and closing doors, or using flashing or animated cuts to indicate that the character is in a building. Once inside the building, the entirety of the building may need to be built in order for the character to logically exist in the game world. For instance, a character who enters a house in a game may need to be able to go to every room in the house even though the focus of the scene is only the kitchen. Similarly, a character in a park or forest must include several artistic elements such as trees, signs, and bushes even if the character will find something under a single tree. And, exploration is usually active. The visual-novel genre allows for players to click from location to location, however most other genres require the player to use an in-game transport, such as walking, running, and occasionally using vehicles. In these cases, interim scenery needs to be built and included in the game.

Another design consideration for locations is whether or not they are gated. Gating means they must be opened by solving a puzzle or moving from level to level. Gated locations may also close after the player has solved all puzzles, spoken to all NPCs, and gotten necessary pertinent information from the scene. Open-world games are not gated, which means that players are able to go to each location at any time. As

locations never close, it is impossible to anticipate where a player will be in the game at any point in time, and care must be taken to pace the game properly when accommodating that.

Objects

Games include two types of objects: static and dynamic. Static objects may be of interest to the character, but they stay in one place. They can be referenced in narration or dialogue as markers for locations or pointers to dynamic objects, but there is no animation required. Dynamic objects are objects which change their state some time during game play. Some dynamic objects are in the same location, but they open or close, or they are able to have other objects placed on top of them. For instance, a decorative cupboard in a game would be static. The player can see it, but not open it. A dynamic cupboard would remain in place, but the player can open drawers and often find and investigate things inside them. Once something is taken out of a dynamic drawer, it can often be replaced in the same drawer.

Inventory objects are a type of dynamic object that can be stored by the player and moved between locations. In simpler games, such as point-and-clicks, inventory is often handled by having the dynamic object disappear from the scene and reappear as a symbol in the player's inventory. This requires an inventory section which holds dynamic objects and understands which objects it contains at any time. More complicated games may show characters holding objects or carrying them on clothing, in containers, etc. Another consideration of inventory objects is the range of actions players are able to

do with them. The game must be programmed to recognize when a player is in possession of a needed object and respond to puzzles appropriately, and to allow combinations of items if the game requires it. Finally, because dynamic objects can be moved, designers must determine where they go if the player drops them without using them in the correct puzzle or combination. In some games, they simply return to their place of origin, while in others they stay in the location where the player dropped them. These design considerations have differing budget implications and must be considered carefully.

Finally, there are markets, which are a group of inventories that require a currency exchange for objects. Game markets need to be able to recognize and count in-game currency as well as the number of items it has in a specific category. When including markets, it is important to consider locations to ensure that the player can get to each market when needed. Designers will need to consider whether the markets will hold all possible objects in the game, only premium items, whether the supply of each item is limited, and if characters, such as merchants, will assist with player purchases.

Story Beats

Story beats or chapters are often translated into complete levels, which will contain characters, locations and objects. These elements must be specified for each story scene/game level. Autosave points in the game can be arranged around story beats, which can be translated into multiple levels, or around single levels (i.e., save at each level change), or at specified locations (i.e., save every time the character returns to their home base) or times (i.e., saves at 'midnight' in-game).

An important interactive element that affects each scene is the concept of triggers. Game triggers are programmed actions that the game performs automatically when prompted by player action. For instance, a player can enter a location for the first time, which triggers another character to introduce themselves and ask for help. Triggers can repeat with the same action, for instance if a character gives a player important information and the player would like to hear it again, or they can update, for instance if the player returns with an asked-for item and wants to resolve a quest.

The book itself can guide these level decisions, however it is best to have a storyboard which includes the characters, locations and objects for each scene as well as attributes such as static, dynamic, and type of interaction for objects.

Intellectual Property

There is also the issue of intellectual property (IP). While game designers can, and must, make adaptations when transforming books to games, it is important to understand the essence of the characters and worlds in the books. When adapting a single book to a game, it may be necessary to read other books in the series, or other works by the author. It is also important to understand the purpose for the game. If the author desires a direct transformation, then the game may tell the story of the book. However, there may be instances where the author or publisher does not want a game that integrates the book exactly because the game may be seen as a replacement. Understanding the IP in more depth than the book will allow the designer to integrate aspects of the world and characters that expand the story in a way that acts a prequel to the

book, or a side quest of sorts. For instance, a game designer may use locations from the book and focus on a minor character in the book rather than the main story.

Discussions about IP should include discussions about authorship. The designer consults with the IP holder regarding the design of the game, however in cases where the game and book will differ between stories, it is important to distinguish the differences, who contributed, and who owns the new work. Aspects of this agreement should be included in the credits of the game, which will be public-facing. For games that will be compiled before being distributed, a bulleted summary can be included in a commented section near the beginning of game code. This does not replace a legal contract and is not meant to be public-facing. It is simply a way to have the agreed summary at hand, available, and associated with all copies of the game.

These IP design considerations will generally work with independent game development for independent and newer authors, however works commissioned by major publishing companies or for literature established within the zeitgeist will often have detailed licensing agreements that outline specifics about what can and cannot be done with characters and worlds in the game (Bernal-Merino, 2009).

The Framework

The framework (figure 2) sets the design considerations into stages, guiding developers to focus on the aspects of development in a cohesive way that results in a game that retains the key elements of the book as well the guidelines around

game creation for children. In the first stage, the designer considers the target ages of the books and the screen time parameters recommended by regulating agencies. Screen time should determine the length of game levels as well as the length of the entire game. Designers should also review the age rating guidelines for the country or region that the game is targeted for. Before beginning extensive and specific

planning work on the game, designers must work carefully with authors to determine the book content that will be available in the game, and determine ownership of book elements such as characters and locations, vs code elements that will be included in the game. The developers will also need to clarify publishing arrangements for the games, as they are often different than publishers for the books. Publishers may have

Design Considerations Framework for Converting Children's Books to Games

STAGE 1

Screen Time
0-3 hours/day
15 minute increments

Age Ratings
ESRB in the US
PEGI in Europe

Intellectual Property
Contracts
Ownership / Permissions
Consistent with Original IP

STAGE 2

Casual Game Properties
Pleasant settings
Simple controls
Single-screen levels
Flow waves with breaks
Shiny and responsive

Child Development Phases and Mechanics
Initiative (ages 3-5)
Industry (Ages 6-11)
Identity (Ages 12-18)

Conversion Elements from Books
Characters - Established or Other?
Story Beats –
Past/Present/Future?
Locations – Important only
Objects – Static or Dynamic?

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STAGE 3

Result
Game that is clearly in the same universe as the book
Having similar characters, locations and story beats
Properly including game mechanics appropriate to the book audience
Looks and feels like an extension of the user experience with the books

Figure 2
Design Considerations Framework

insights into desired elements of the books that need to be included in the games, or guidelines around desired game content. With several IP owners, it is important for the developers to maintain thematic consistency with the books in terms of character behaviors, moral stances, etc. so that the game does not depart from the books in a way that book readers will see as a misrepresentation.

Once the regulatory and legal parameters are set, developers can move to the second stage of game planning. In this stage, the game design begins to take shape and game levels are outlined. In this stage, developers will plan mechanics and controls that match the ages of the target audience for the books. Developers will also incorporate the characters, locations, and major story beats of the books into possible game levels. This allows for the result stage: creation of games that seamlessly integrate into book worlds in such a way that readers deepen their experience with characters as well as practice skills such as problem-solving, economic management, and persistence through failure.

Case Study Converting a Book to a Game: Ellis & The Cloud Kingdom

Ellis and the Cloud Kingdom (Rennie Murphy & Rennie Murphy, 2022) is the third in a trilogy of books featuring 10 year old Ellis Monroe, his younger sister Freddye, and their friends. The books feature magical adventures where there main enemy is a group of trolls called Bugabols. During these adventures, Ellis discovers that he is a special type of hero, called a Stone Keeper. Each book features a lesson about life, and Ellis gains a new stone along with each one. Better World Books

has listed the book as being recommended for age groups 6-8 and 9-12 (Better World Books).

In Ellis and the Cloud Kingdom, Ellis and friends are whisked away to a castle in the clouds, where Princess Pearl informs them that Bugabols have invaded the Kingdom and taken captives. Ellis must work against his own ego as he teams up with another Stone Keeper, and work with his friends to defeat the Bugabols. Two scenes from the book were selected for the game design prototype. The first is the trip to the Cloud Kingdom. In the book, Ellis and his friends find themselves suddenly falling through clouds, landing at the Castle. The second scene has the team working to rescue the captives. The book has been recommended for ages as young as 6 (Betterworld Books), so the game will be appropriate for that age group as well. Due to the age group, the book author and the game designer decided that enemies will not be killed, but simply banished back to their kingdom.

The Journey

The scene where the group travels to the castle could be designed in several ways. One way is with a falling maze mechanic in which the characters "fall" through a vertical maze while the player character moves them left and right in order to avoid obstacles. In this mechanic, the characters usually fall slowly and then speed up as they progress through the maze. Since the main challenge in this game mechanic is the increase in speed, it may be too challenging for the target age group. There is also the teamwork element, which is emphasized in the book. For the game, this would translate into the player handling multiple characters. A maze that speeds up

and finally allows reaching the goal, only to be followed by another speeding maze, could create a combination of boredom through the same mechanic as well as too much challenge. One way to handle this is to have each character move through the maze with a different difficulty level, so that the entire first maze/character combination is quite easy and the following combinations more difficult.

To provide variety and challenge more appropriate to the age, the prototype design used a platforming level. Platformers are relatively common and easily learnable by most game players. Also, while some platform levels do increase the character speed as they go, most provide challenge by having the player jump to higher platforms, however, since platform levels scroll left to right, the player often must jump down a level or two just as much as they jump up. Challenge does not have to involve speed at all. There can be moving platforms which require precision and timing, ladders that lower and retract, enemies or obstacles to jump over, and puzzling maze-like designs that require the player to figure out how to get the character to a desired location. Further, platformers can include the player controlling multiple characters at once. In some platformers, such as Fireboy and Watergirl (Oslo & Cool Math Games, n.d.) and Never Alone (Upper One Games, 2014), multiple player characters are handled by the player, and they must work together through the level. In Fireboy and Watergirl, one character will often have to stand on a button in order to lower a platform that allows the other character to ascend. In Never Alone, one character often scurries up mountainsides and then lowers a rope down to the other. Other team-based platformer mechanics include balancing, guidance, inventory management and other forms of help.

Collection is a common feature of the platformer genre, with arguably the most memorable being the coins collected in Nintendo's Mario games. These collection items have double roles as challenge providers and currency. They provide challenge by being placed in seemingly inaccessible places, which forces the player to use jumps and solve puzzles to get to them. Later in the game, the coins can be used as a score or the player can purchase things with them. This fits with the Stone Keeper role in that Ellis collects stones. In the books, he gets a single stone per story, and that stone wields a magic power. However, the prototype uses the stones as a collector item during the platformer levels (figure 3). This removes the element of surprise in the book in that Ellis will get stones before he gets to the Cloud Kingdom, however the player is not told what the stones mean or what they do while collecting them during the platformer. Like other platformers, the stones are placed above the clouds and also in arcs from cloud to cloud, allowing the characters to collect them as they jump, and motivating them to move across the entire board of clouds to collect all of the stones. As with most platformers, players can move characters up, down, left and right, with the illusion of moving diagonally as they jump.

While paired puzzles with buttons and levers are more compelling, this prototype is built for the mental and physical capacities of players in the 6-11 age group. Therefore more traditional platforms are more appropriate, with variations added for difficulty and engagement. In this case, the multi-character aspect is handled through varying levels. It is not uncommon for platformer games to have at least 4 levels, and the book has 4 characters that go to the Cloud Kingdom. Each character has a level in which the player takes them from their home

Courtesy of:
Katryna Starks, Game Design Griot
Cerece Rennie, LionSky Publications
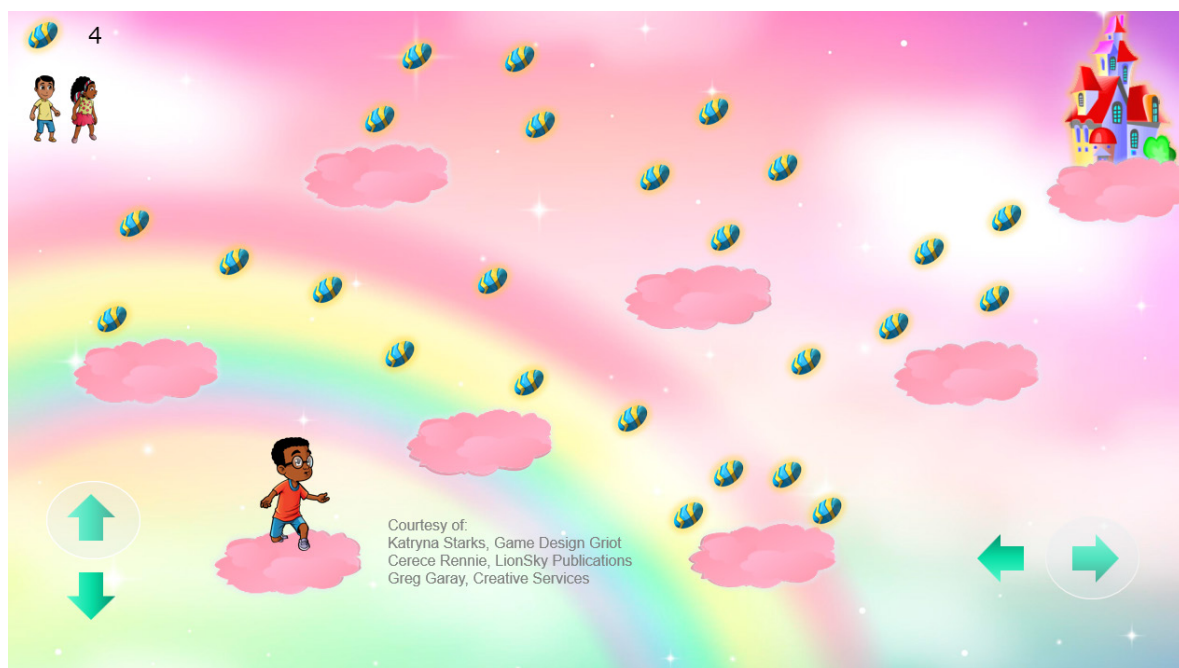Greg Garay, Creative Services

Figure 3
Prototype Ellis Platformer Level – Characters used with permission of LionSky Publishing and Greg Garay Creative Services

on the ground and to the castle in the cloud. Things that will change in each level are level backgrounds, the placement of cloud platforms, placement and number of stones, and the type and frequency of obstacles. Since Bugabols are introduced in earlier stories, the characters can encounter them here as well. While these variations may seem similar to the falling maze discussed above, there is more variety available due to the 8-directional movement in a platformer. Players can either go back to gain stones they missed and catch Bugabols they passed earlier, or even plan a strategy that includes going backward and/or revisiting.

The Rescue

The second scene in the prototype involves Ellis and the team working together to free the captives taken by the Bugabols. While some games would accomplish this by creating a direct shooter game, the designer has chosen a method which does not involve characters holding weapons. This is consistent with the character design in the books. For that reason, this level contains a tower defense mechanic, in which the player places towers around the route that characters travel. The characters are trying to get to the center of the level to free

Figure 4
Prototype Ellis Tower Defense Level – Characters used with permission of LionSky Publishing and Greg Garay Creative Services

the captives, however Bugabols will chase them in an attempt to get there first and guard the cage. If too many Bugabols get to the cage, Ellis and friends will not be able to open it and the player fails the level. With this scenario, Bugabols are enemies but not directly violent toward the characters, only presenting themselves as a strong barricade.

In a technical sense, the towers themselves are shooters, as they shoot magic at the Bugabols, weakening them until they have to return home. The tutorial text at the bottom of the level makes this clear, using the words "Use the towers to zap

the Bugabols and banish them from the Cloud Kingdom!" (figure 4) The wording makes it clear that the Bugabols do not die, they are merely banished. This is also consistent with the tone of the books.

The levels are connected by the Stone Keeper stones. Characters collected the stones on the platform level as they journeyed to the Cloud Kingdom. These stones will be used as currency to buy and upgrade towers to fight the Bugabols and rescue the captives at the end. In the book, there is much that happens in between the journey and the rescue, however this

prototype is limited. This game is adapted from a children's book and is therefore created to enhance the book and guide children to it. The game is not attempting to circumvent the experience of reading, which would undermine the educational experience. The tower defense reinforces the importance of the stones for the Stone Keeper, and the goal that all characters must get to the cage reinforces teamwork, which conveys the life message in the book without revealing the entire story.

Conclusion

This paper considers that children's books can be converted into video games in order to expand the reader experience and maintain exploration of the book world, and that game developers may not understand the design considerations required for making such games. To that end, research was performed to discover the various aspects of game design for children. Regulatory aspects of children's game design were investigated, such as screen time and age ratings. Intellectual property concerns were considered. Erikson's stages of identity was used to match individual game mechanics with children's needs, and casual game design elements were used to influence child-friendly design. All the while, careful consideration was made to make the games match the atmosphere and characterization of the books. Finally, the researched elements were combined into a framework of design considerations, with recommended stages for completion, followed by a case study featuring a game prototype with gameplay that was inspired by the book, 'Ellis and the Cloud Kingdom".

This is a novel framework with a single case study. Future research would include multiple case studies to ascertain whether designers are able to apply the principles to games they translate from books. The framework could also be reviewed by children's book authors and book publishers for accuracy within their processes. Finally, educational potential of the framework could be explored via research that tests whether children remember elements of the book worlds by playing associated games created with it, including any educational content or social lessons that books were trying to convey.

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