TENETS OF SELECTED PICTUREBOOK SCHOLARSHIP APPLIED TO THE

PRACTICE OF THE ADAPTATION OF THE PICTUREBOOK,

***THE KING HAS GOAT EARS*, TO A PICTUREBOOK APP**

by

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Abstract

This hybrid creative study distills concepts from picturebook scholarship, and writings on audiobooks, sound semiotics, multimodality, and reading as a form of play to create a set of guiding questions for the creation of a story app called T*he King's Ears.*

Three important concepts foreground the inquiry. Firstly, picturebook stories are played multimodally through the combined contributions of words and pictures. Shaping the app's modes of sound, interaction, and animation to interrelate with the words and pictures, and with each other to tell the story was the central challenge of the app design. The second significant idea that governs this design-based approach is that children read picturebooks differently than adults do. The third principle is that the interactions, sounds, animations, and navigation of the picturebook app should be child-controlled and replayable. From a process of iterative cycles of design, enactment, analysis, and redesign to develop an original media artifact, a framework emerged that can be used to guide the development and assessment of picturebook apps, as well as sharable theories that can inform the work of other designers.

Preface

This dissertation is original, unpublished, independent work by the author, Cynthia Nugent.

Table of Contents

List of Figures

Acknowledgements

For Kathie Shoemaker who opened so many doors.

Chapter 1: Introduction

1.1   Motivation for the Study

I was a literature student before I became a largely self-taught artist. After working as a visual artist for 15 years (first exhibiting in 1981), I started illustrating children's books and latterly wrote two books, the novel *Francesca and the Magic Bike* (2004) and the picturebook, *Fred and Pete at the Beach* (2009). I received my first illustration contract in 1993 from Red Deer Press to illustrate *Mister Got to Go* by Lois Simmie. To date, I have contributed as illustrator and/or author to 20 published books, many of which have received awards.

As a fine artist, I've had 18 solo exhibitions and contributed paintings and automata to numerous group shows. The automata demonstrate my long-standing interest in animation and interaction. Influenced by a video by the *Cabaret Theatre* studio, which demonstrated the mechanisms of their automata, I began building and exhibiting wooden automata around the same time that I started illustrating children's books. I started to incorporate story text in my painted wood automata in a solo exhibition of interactive fairy tales called *Rumpelstiltskin's Cupboard*.[1] In *The Juniper Tree*, a series of nine boxes open to reveal text facing an image; and in *Father Bluebeard* (see fig.1)*,* the viewer interacts with the moving parts to play out the narrative described in a poem painted on the inside of the cupboard door. *Father Bluebeard*, in particular, anticipated my work with apps with its interrelated words, images, sounds, and mechanical devices for interaction.

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[1]   Kathie Shoemaker and I each had our own gallery for this show and while we discussed what fairy tales we would work with, there was no collaboration on the individual pieces.

Lower level Detail
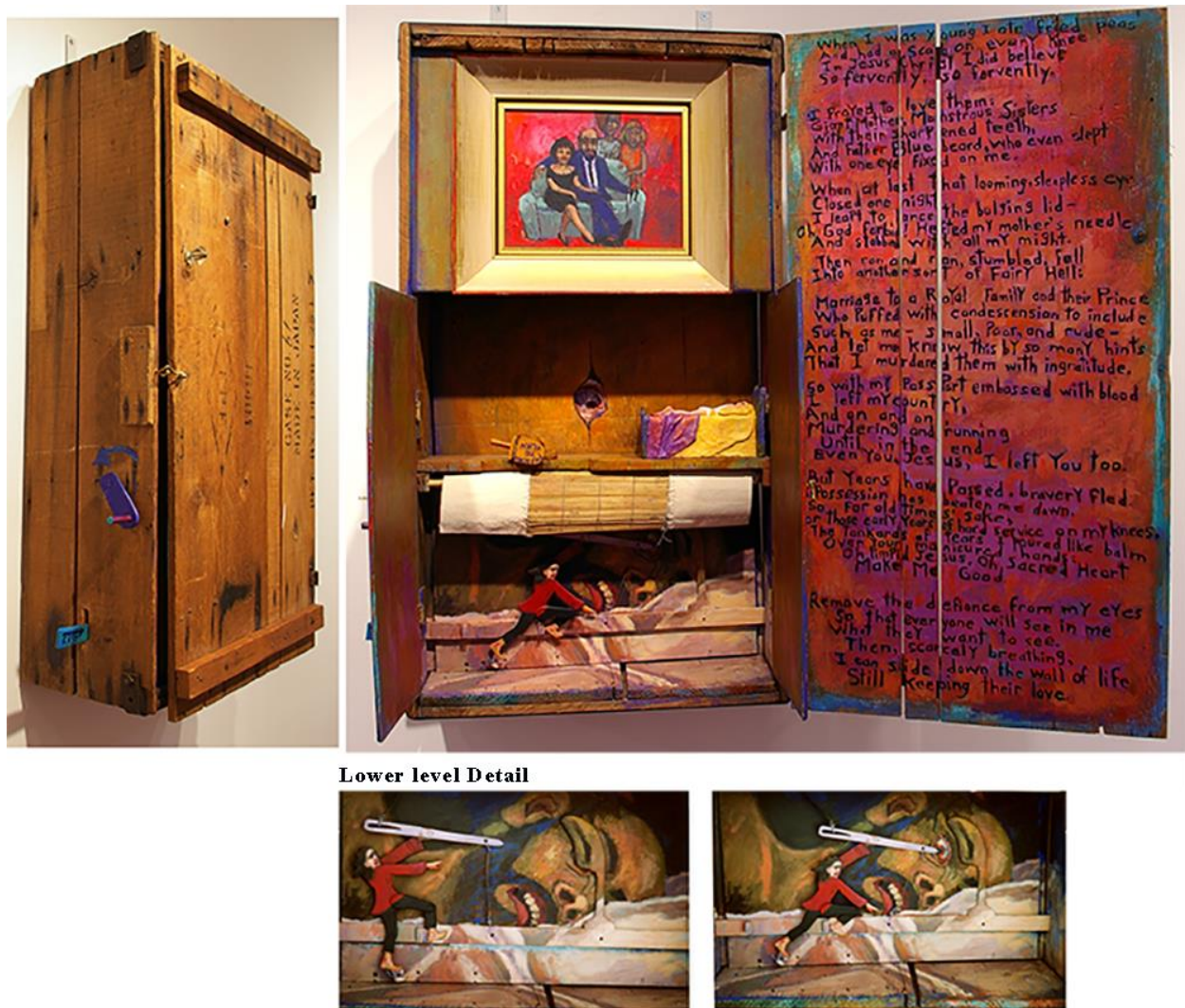
Figure 1. Father Bluebeard, an interactive artwork incorporating text (Nugent).

Movement is implicit in many narratives, and like other children's book illustrators, I struggled with how to convey it in the still image, longing to show the blinking of an eye, rocking, splashing, a flickering candle, a double-take, or lights gleaming and twinkling in the dark, and have employed all the illustrator's tricks to approximate them. It was only in researching this thesis, however, that I looked systematically at the techniques picturebook illustrators use to represent sound and movement in time and space. (Please see chapter 2.6 for an overview of the ways children's book illustrators have shown movement, and chapter 2.7 for sound.)

It was very exciting to see in the spring of 2011, during the first year of my Master of Arts in Children's Literature (MACL) program, a trailer for the app, *The Heart and the Bottle,* adapted from Oliver Jeffers' picturebook of the same name. This new picturebook format seemed the perfect hybrid form of book and animation because of the way it showed exactly the small amount of movement that I had always wished I could put into a book illustration. I knew right away that the picturebook app would be the subject of my thesis.

At first, my thesis was going to build on a shared reading assignment for the course LLED 565A, Picturebooks and Children's Literacy Development,[2] which explored children's understanding of narrative in two contexts: 1) the app of *The Heart and the Bottle;* and 2) the codex version of the same story. However, an assignment for LIBR 559B, New Media for Children and Young Adults,[3] given by Dr. Eric Meyers gave me an opportunity to design an app. I created a storyboard for an adaptation of the picturebook *The King Has Goat Ears* by Katerina Jovanovic and Philippe Béhà. This process was very satisfying and made me realize I could draw on what I knew from writing and illustrating children's books, creating interactive automata, and what I was learning in the MACL program about picturebook scholarship to create picturebook apps. But, to accomplish this I would need to collaborate with a computer programmer or find app-authoring software that didn't require computer-programming skills. So began a year-long search, which involved in-depth trials of a number of app-authoring software tools. This journey ended with the discovery of Robot Media's Storybuilder, which allowed me to create an app with animations, interactions, and sounds, all without having to write computer code. While the capabilities of this tool are limited compared to

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[2] LLED 565A is a graduate course offered by the Department of Language and Literacy Education at the University of British Columbia, Vancouver, Canada. I took this course in May, 2011 from Professor Margot Filipenko.
[3] LIBR 559B is a graduate course offered by the School of Library, Archival, and Information Studies at the University of British Columbia, Vancouver, Canada. I took this course in September, 2011 from Professor Eric Meyers as part of my graduate studies program.

the sophisticated interactions in custom-coded apps like *The Heart in the Bottle* or Nosy Crow's *Cinderella*, I concluded it was the best of the app-authoring tools for non-programmers.

Finding Robot Storybuilder made me realize I could create a real picturebook app from the storyboard I'd created for Dr. Meyer's class, so I acquired the digital rights from Tradewind Books[4] to adapt *The King Has Goat Ears* (Jovanovic and Béhà) for an iPad app called *The King's Ears*.

Creating this app has been a complex and interesting journey. It began with reviewing as many picturebook apps as possible, as well as some games and the digital toys of Toca Boca and Sago Mini—open-ended children's apps designed to stimulate narrative play. My exploration also included reading scholarly writing on picturebooks, emerging scholarship on picturebook apps, texts about multimedia and multimodality, app reviews, and the writing of children's app developers. I also joined a weekly twitter conversation called #storyappchat and attended several conferences. But, the more I immersed myself in the picturebook app world, the more I realized that there were very few picturebook app developers who intimately understood the picturebook or had any background in children's publishing. One reason for this could be that because picturebook apps use the same technology as video games, many of the people who first entered the field were video game developers who saw an economic opportunity in what was then perceived as the growing children's app world. Many of the first apps produced were nostalgic, representing picturebooks as antiques, rather than as a living art form with contemporary practitioners. App adaptations of Beatrix Potter's *Peter Rabbit* (Loud Crow Interactive), Lewis Carroll's *Alice in Wonderland*, such as *Alice for the iPad* (Atomic Antelope), as well as several versions of Brooke's telling of *The Three Pigs* came out in digital format, but were designed to look like they are made of fading and foxed paper. There has

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4   My agreement with Tradewind is a revenue-share contract and no money has changed hands. The agreement includes permission to reproduce text and images from the book in this thesis.

also been a trend for big media companies, like Disney, to repurpose their existing film assets as picturebook apps by intercutting video clips with still images and purpose-written text.

Only a small percentage of the commercially available picturebook apps are created by artists, authors, and designers of the calibre of those found in children's publishing. Firstly, the technical and financial barriers for small publishers without programming expertise or the budget to hire computer programmers are prohibitive. Secondly, the artistic, academic, educational, and critical culture that supports the picturebook has yet to include the picturebook app, nor has a separate cultural matrix of any significance grown up around this format. For instance, there were no app awards when *The Heart and the Bottle* app was published because the scholarly and literary community viewed the format as a novelty. As a result, this beautiful picturebook app was largely ignored, although recognition of Oliver Jeffers as a preeminent artist and picturebook creator continues to grow. It is my belief that the picturebook app designed for tablets is at the very beginning of its evolution, and as technical and financial barriers come down, we will see more literary artworks in this format, such as the remarkable *Metamorphabet* by Patrick Smith (Vector Park).

1.2   Background

1.2.1   Affordances of the iPad

What makes the iPad tablet different from other computers is a highly reactive and responsive touchscreen that makes it very accessible to children (Hourcade, Bullock-Rest and Hansen 167). The possibilities of the multitouch screen for children of various abilities, particularly those with reading and developmental challenges, have yet to be fully explored, but initial research suggests it has a great potential to support learning. The glass screen of the iPad replaces the mouse or trackpad used with other computers. When the pad of the finger touches the screen, the electricity

in the human body is detected by the device. Warren Buckleitner, an educational psychologist and founder of the Dust or Magic Institute, *Children's Technology Review*, and the KAPi and BolognaRagazzi Digital awards, mentions the magic of using the finger directly on the screen, as well as the extreme sensitivity of the iPad's surface, which allows for up to eleven simultaneous touches (multitouch) so that several children can play on one iPad at the same time. In his *Child Development 101* lecture at the Dust or Magic App Camp 2013 conference that I attended, Buckleitner said the device is intuitively playable by even very young children because touching and pointing are natural developmental stages. Using a mouse, however, must be learned, and even once mastered, still keeps the player at several removes from the interaction compared to touching the screen for an instant response. The app allows "the continuous interplay between reading, watching and listening, and for the child, tapping and drawing a finger across the responsive animated surface of a picturebook app makes a meaningful connection with the story" (Schwebs 9).

1.2.2   Picturebook App Characteristics

After the commercial release in 2009 of the iPad, picturebook (or story) apps—appeared in the iTunes App Store. These digital picturebooks with expanded multimodal affordances to include sounds, animations and interaction have most of the multimodal characteristics of the CD-ROM story that preceded it, but are much more accessible because of the touchscreen. Schwebs tells us that the word digital comes from Latin for finger and that the most important difference between reading a picturebook and a picturebook app is the use of the finger to uncover aspects of the narrative (9).

App developers have created many innovative interactive elements in picturebook apps by taking advantage of the built-in features of the iPad including the microphone and speakers, camera, multitouch screen, and several kinds of sensors, such as the accelerometer. These sensors allow the

tablet to respond to rotating, tipping and shaking. One example of a clever narrative-related interaction based on the iPad's affordances can be seen in Nosy Crow's *The Three Little Pigs*, where blowing into the iPad's microphone at the point in the story when the wolf is huffing and puffing will initiate an animation of the straw house falling down.

Because it is such a new form, debate continues amongst educators, developers, reviewers, librarians, publishers, and scholars as to what constitutes a good picturebook app for children. While much of the discussion is centred on educational apps and games, the body of literature by scholars who understand the picturebook is growing. Librarian Elizabeth Bird writes that the picturebook app should be assessed like picturebook, that is, we should ask how well the art and text are integrated with the interaction and whether it offers anything "that a simple lapsit with a print book and an adult does not" (Bird 1-2).

But there is no reason that the iPad is not also suited to a lapsit. Its size, light weight, and screen that can be seen in any light condition encourages sharing. Ghada Al-Yaquout (64) and Erica Hately (7) both comment on the physical similarity of the iPad and the picturebook. "Indeed, the iPad screen comes quite close to the size of many picturebooks . . . it appears as if its primary aim is to come as close as possible to the experiences had with the conventional codex picturebook" (Al-Yaqout 65).

Picturebook apps can be adaptations of print books or created for the platform: Schwebs calls these digital immigrants and digital natives (2) respectively. Both varieties of app can have the same enhancements of sounds, animation and interaction. In her *Horn Book* article, Bircher says that the additional modes of picturebook app should be interdependent to create "meaningful counterpoint between all parts of the app. Every aspect of an app—text, images, narration, music and sound effects, and interactive enhancements—should be accessible and enjoyable, not distracting" (2).

Many commentators, especially those with an instrumental view, insist that good picturebook apps should have word highlighting synched with the narrative. Other recommended customizable features are Read to Me, Read Myself and Autoplay modes, as well as being able to choose the language. Baird and Henninger point out that there is no standardization in user interface in picturebook apps and feel this is a drawback. They go on to say that there are usually no options to customize font size and screen brightness in picturebook apps (12). This complaint points to the confusion over the difference between ebooks and picturebook apps. They call *The Cat in the Hat* app by Oceanhouse Media an ebook and criticize it for not having adjustable font. The screen and text can be adjusted in ebooks but the picturebook app is more like a codex picturebook in this regard—the font and its layout are fixed and part of the design. Unfortunately, programmers usually disable the built-in iPad pinch-and-spread zoom gesture so this can't be used to expand print size within the picturebook app. Baird and Henninger also call for standardization in user interface, navigation design, and customization options for the user (13). But, it should be pointed out that there is no standardization of layout or paratextual elements in the picturebook either.

Picturebook apps can be downloaded from the Apple App Store at a cost ranging from free to $10.00; most costing about $5. They are generally much cheaper than ebooks, which is puzzling considering how much more difficult and expensive it is to produce a picturebook app. The ebook, with its limited interaction, can be produced the same way a print book is by using the publishing industry's standard book-layout software, InDesign. Once laid out in InDesign, a book can be exported to the printer as a pdf, or if for digital use, as an EPUB. Recent versions of InDesign allow the designer to add media to the document, such as narration or videos. Another relatively easy way to make an ebook is to use Apple's free iBooks Author software, which functions like word-processing software, letting the user type or paste in text, and drag in images, video, and audio files. More interactivity can be added through the use of third-party software, such as Bookry's interactive

minigame templates, which are designed to work with iBooks Author. The picturebook app (short for application), on the other hand, is not a document file but software, and as such, is a much more challenging and expensive endeavour requiring computer coding by programmers who knows how to write for the operating system of Apple's mobile devices (iOS).

Since the introduction of the iPad, many brands of touchscreen tablets have entered the market. These use different operating systems, generically called Android. Android apps are sold through online retailers such as Google Play, Amazon, and Barnes and Noble, but not in the Apple App Store. The market share of Android devices is growing, but this thesis will focus exclusively on the iPad and iPad apps.

Publication of picturebook apps differs significantly from publication of codex picturebooks: picturebook apps are not required to have an ISBN, nor does Library and Archives Canada keep track of them. And, while there are versions of apps, similar to the editions of a codex, early ones are eradicated by updates. In print, errors are expensively corrected by tipped-in errata notices or in subsequent editions, but for apps revisions are sent out as free downloadable updates. Where in publishing, every effort is made to publish an error-free book, flawed apps are regularly available for purchase. Even as prominent a publisher as Nosy Crow had an update available the day after it launched one of its fairy tale apps.

1.3   Purpose of the Study

For this study, I did a literature review of current scholarship to cast light on the picturebook app as a multimodal literary artwork. I wanted to see if picturebook scholarship, which views the picturebook as primarily a marriage of the modes of words and pictures, could provide a framework that could usefully be extended to discuss and evaluate the additional modes of sound, interaction, and animation that the iPad picturebook app affords. However, it was interesting to begin by looking

9

at how picturebooks have managed these three modes and even anticipated their use in the picturebook app. Nikolajeva and Scott, Schwarcz, Nodelman, and Van der Linden have all written about motion in the picturebook; and Schwarcz has examined in depth how picturebook illustrators have represented sound. But sound and animation are only inferred in picturebooks, so to discuss their actualization in picturebook apps it has been useful to turn to scholarship on audiobooks, sound semiotics, the fledgling field of children's app design, studies on how children read on digital devices, app reviews, articles on picturebook apps in the popular press, and my own conclusions from close readings of a selection of picturebook apps (see appendix A).

I also downloaded and reviewed educational and toy apps to gain a broad familiarity with the field. I reviewed book apps for ages two to adult to become acquainted with their strengths and weaknesses as multimodal texts, and to learn what interactive mechanics could be adapted to *The King's Ears.*

During my research, I became aware of the link between movable books and picturebook apps, both historically and in a resurgence of interactive codices paralleling the growth of digital interactive books. At the same time, recent studies evaluating the role of play in education have given new validity to interactivity in books formerly dismissed as novelties. I reviewed a number of movable books and analyzed their strengths and weaknesses as multimodal literary texts. I also analyzed their mechanics and noted which of these are distinct to the codex, which have been translated to digital books (e.g., tab pulls translated to digital sliders), and which of the mechanics seen in apps have grown out of digital affordances.

This creative project demonstrates how the scholarly literature can guide the creation of picturebook apps of literary merit. It also required a deep exploration of the iOS app design space and an expansion of my skills as an artist and picturebook maker to design interaction, reformat the picturebook art, edit its text to fit the iPad's real estate, edit sounds, and create sprite animations. I

learned a number of new software programs, and was grateful for my background as an amateur musician to help me with the sounds and musical interactions in the app. Not least of the aspects of app creation was learning the technical language and the way assets needed to be formatted in order to collaborate with programmers, as it quickly became evident that my design was too sophisticated for app-authoring software.

It is my hope that this study will provide additional guidance for those seeking to remediate and adapt picturebooks to the multitouch format. These principals may also be useful for those who wish to assess and review picturebook apps.

1.4   Significance of the Study

The aim of this study is to provide a theoretical resource for digital multimodal art-making and provide a bridge from the interconnected world of picturebook publishing, education, and academia to children's picturebook app creation and discourse. I will build on Ghada Al-Yaqout's article "From Slate to Slate," which examines the picturebook app through the lens of picturebook scholarship, with a deeper discussion on the meaningful integration of the modes of sound, animation, and interaction as they apply to the practice of creating a picturebook app. My app design will demonstrate how the thoughtful and artistic additions of well-integrated, respectful, and meaningful sounds, interactions, and animations can add to the enjoyment and understanding of the picturebook, particularly for readers who find imaginative entry into written text difficult.

This thesis will add to the growing body of scholarship on the picturebook app, the effect of which may be to raise the status of the picturebook app as a literary artwork as well as establish standards for creators. Henry Jenkins argues that, "for new media such as video games, serious critical and scholarly analysis is a vehicle for the maturation of the medium, for the training of its practitioners, and for the education of its audience" (qtd. in Bizzocchi and Tanenbaum 270).

1.5 Research Questions

The following questions frame this study and creative work:

- How can picturebook scholarship concerned with the multimodal relationship of pictures and words be usefully extended to examine and evaluate the additional modes of sound, interaction, and animation afforded by the iPad picturebook app?

- Can a picturebook app also be a literary artwork comprised of interdependent modes in the way a picturebook is and, if so, how can the picturebook app be differentiated from the digital toy?

- How can the application of the multimodal picturebook frame to picturebook app design create a useful set of tools for both the evaluator and the creator of the picturebook app?

1.6 Key Terms

Accelerometer: One of the sensors built into the iPad and other iOS devices. It enables the device's screen to switch automatically from landscape to portrait mode in response to how you turn the device in space. Other sensors respond to light and in more recent generations to a three-axis gyroscope. Combining the gyroscope with the accelerometer gives these devices six axes, which makes them more sensitive, responsive, and powerful for video games and apps.

Android: The mobile device operating system created and owned by Google. It is used to run Google devices as well as those manufactured by many other smartphone and tablet manufacturers throughout the world. Apps made to work on Apple devices (iOS) will not work on Android devices and vice versa.

Animation—Idle: A short looping animation that gives a character on the screen an appearance of life even when it's not in play. For instance, in *The King's Ears* on the screen where the shepherds cut the reeds, there are idle animations of the sheep chewing grass. When touched they baa.

Figure 2. Animation sprites for the interactive flying bird in *The King's Ears*

Animation—Sprite: Used in video games and apps, sprite animation is a sequence of image files (see fig. 2) with transparent backgrounds (typically .png file format), which when shown sequentially, appear to animate on the screen. It differs from frame animation, which only exists as a video. It is possible to place hotspots (small areas defined by their coordinates) on a video, but the individual objects in the video are not responsive. A video clip is one rectangular object no matter how many things appear to be animating in it, and is non-interactive except to start and stop. The sequence of sprites that make up a sprite animation is a separate object, which can be played with separately from the other objects on the screen. For instance, a sprite animation of the flying bird in *The King's Ears* can be dragged around the screen while it continues to flap its wings, something you couldn't do with a flying bird in a video.

App-Authoring Software: Software for creating picturebook apps that doesn't require computer programming skills. For example, Robot Storybuilder allows you to type or paste in text and drag in pictures. You can also put in player-activated sounds, sprite animations, videos, and interactions, but the customization is limited.

App Store: Apple's online retail outlet that sells digital media such as movies, music, and apps. Apps sold in the App Store only work on Apple devices. Apps must be submitted to Apple for curation and will only appear for sale in the App Store if they pass Apple's criteria of technical functionality and appropriate content.

Assets—App: Text, images, and sounds to go into the app.

Beta: A not-quite-finished version of an app sent out for feedback before final publication.

Bug: A mistake in computer coding, which results in an app not working as it should. *The Heart in the Bottle* (Jeffers) has a number of bugs that HarperCollins has decided not to fix.

Crash: The sudden failure of a software application resulting in it shutting down or freezing.

Developer: Similar to the word publisher, the term developer can refer to a person or a company. The developer always handles the computer coding part of app production, but may also take on different aspects of design as well. The developer can be the publisher of the app or be employed by the publisher. For example, HarperCollins is the publisher of both the book and the picturebook app *The Heart and the Bottle*. The developer was Bold Creative, a design company commissioned by HarperCollins to produce the app.

Ebook or Picturebook App? The ebook is a digital document, frequently associated with EPUB or PDF format, that can include pictures, narrative, and video. Its interactive capabilities may include narration, word highlighting and pronunciation, dictionary, and format and font adjustment with reflowable text.

Unlike the ebook, the picturebook app tends to have fixed font size but may have word highlighting. The app may make use of the iPad's built-in camera, microphone, accelerometer, and multitouch. Technically the app is software, rather than a document. A picturebook app is made with limited app-authoring software or custom-built with computer code to make incredibly diverse

player-activated interactions and effects. Warren Buckleitner says to think of the relationship of the ebook to the picturebook app as "a messy continuum between less and more interactivity" ("Thinking Outside the Page: Four Views of Children's eBooks" 10).

Gestures—iPad: Kinds of touch which include tapping, dragging, and pinching and spreading with two fingers. Some gestures imitate physical interactions with real objects. For example, in the picturebook app, *Moo Ba La La La* (Boynton), the action of dragging back then letting go of the dogs and cats sends them flying off the screen. The illusion is so complete that it actually feels like you're pulling back and releasing a slingshot.

Google Play Store: The online retailer for Android apps

Incidental (used interchangeably with **ornamental**)**:** A sound, animation or interaction which does not carry narrative meaning but may be included because it is irresistibly cute or expected by the player. For instance, tapping a sheep to make it baa, because it would be odd if it didn't.

Integral: A sound, animation or interaction, which carries narrative meaning and is interrelated with the other modes used to tell the story.

Interactivity: In this paper, "interactivity" means physically interactive, namely touching or otherwise physically acting upon the iPad to trigger movement, sound or some other detectable response.

iOS: The operating system for Apple mobile devices, such as the iPad, iPod, iPhone and the Apple watch.

Loading Screen: The screen showing while the program is loading. Sometimes it has a status bar or words such as "please wait while loading."

Memory Management: This term refers to the act of managing computer memory while the app is running. The essential requirement of memory management is to provide ways to dynamically

allocate portions of memory to programs at their request and free memory for reuse when no longer needed. Large image files in *The King's Ears* made effective memory management essential to prevent the app from crashing while in use.

Ornamental (used interchangeably with **incidental**): A sound, animation or interaction which does not carry narrative meaning.

Parallax: A visual effect used in animation and digital media to create the illusion of depth in a scene as it's traversed. This is accomplished by making the background move more slowly than the foreground to simulate how a scene appears to change when the viewer is moving, as for example when looking at the countryside from the side window of a moving car.

Picturebook: "A picturebook is text, illustrations, total design; an item of manufacture and a commercial product; a social, cultural, historic document; and foremost, an experience for a child. As an art form it hinges on the interdependence of pictures and words, on the simultaneous display of two facing pages, and on the drama of the turning page." (Bader 1)

Play and Player: Instead of the verb *to read* and noun *reader* associated with picturebook activity, or the bland *to use* and *user* often employed to discuss picturebook apps and digital texts, I have adopted Margaret Mackey's term *to play* as an umbrella verb for the different activities demanded by a multimodal text. "We use it as a verb to talk about music and games: we play the piano or play tag. As a noun, of course, it is a staged drama. But we can also have a play of light (on water, on a screen) or a play on words" (Mackey 166).

Reader (book genre): Readers are picture- and chapter books developed to facilitate early literacy. Often based on a theory of reading such as phonics or whole language, readers are levelled by difficulty in order to gradually increase vocabulary, comprehension, and reading fluency. Structured elements include word length, line length, vocabulary, and text-picture congruency.

Resolution: In this paper, resolution refers to image size. In print publishing, an image file must be at least 300 pixels per inch (ppi), therefore image files for picturebooks must be made from high-quality scans or photographs of art and are very, very big. On the other hand, resolution for any television or computer screen has, until recently, been a mere 72 ppi. Screen pixel density increased with the introduction of high-definition (HD) television and computer screens, which doubled the pixels per inch. Now Apple has introduced Retinal Display, which at 220 ppi, has nearly triple the resolution of the standard screen resolution of 72 ppi. To accommodate the higher resolution, Apple had to raised the maximum app size to four GB. Because Apple is in the business of selling apps that make its devices look good, apps must be at least HD to be considered for the App Store. This means that picturebook apps, especially those rich in animation like *The King's Ears*, take up more room on a device and take longer to download. It is also a challenge for developers to make big apps run smoothly.

Story App: A common commercial term, along with children's book app, synonymous with picturebook app.

Touchscreen: The iPad's glass screen responds to touch and allows up to eleven simultaneously (multitouch).

Update: When bugs have been fixed, the publisher posts an alert in iTunes to let app owners know that a free update is available for download. Sometimes these updates don't just fix bugs and update the app to make it compatible with upgrades in devices, but actually change the content of the app, deleting the earlier version in the process. This creates a regrettable state of vanishing editions. I was very fond of the meditative quality of the first version of Toca Boca's *Robot Lab* and do not care for the "improved" bright, noisy update—alas, version one is now lost.

User Interface (UI): The aspects of app design that deal with operating the app and finding your way around (navigation). These include screen layout and icon design, decisions on how sounds turn

on and off, how screens are changed (e.g., whether to use a button or a swipe), and where the menu is located and how to interact with it. User Interface design has become a specialist field in itself.

Chapter 2: Literature Review

2.1   How the Modes of Words and Pictures Work Together in Picturebooks

Picturebook scholarship looks closely at the relationship between words and pictures. It makes a distinction between the illustrated book and the picturebook. The storybook or illustrated story has a preponderance of words, often with imagistic language, which can be completely understood without the pictures. In an NPR radio interview, Martin Salisbury said that, "traditionally, illustrated books are books where the text makes perfect sense on its own, it doesn't necessarily need illustration ("The Artistry of Children's Picturebooks Revealed"). A fuller explanation of that distinction can be found in the book that occasioned the interview, *Children's Picturebooks*, in which Martin Salisbury and Morag Styles write,

> in contrast . . . in the picturebook the visual text will often carry much of the narrative responsibility . . . meaning emerges through the interplay of word and image, neither of which would make sense when experienced independently of the other. (7)

Consider also Uri Shulevitz's concise definition: "A story book [equivalent to Salisbury's "illustrated book"] tells a story with words. Although the pictures amplify it, the story can be understood without them. The pictures have an auxiliary role, because the words themselves contain images" (15). The best picturebooks, however, are a marriage of words and pictures, each mode of expression equally integral to the book.

Perhaps the most-quoted scholar on the way words and pictures work together in the picturebook is Perry Nodelman, whose book *Words about Pictures* contains gems about the relationship between words and pictures on nearly every page. He says that despite being dissimilar forms of expression, using words and pictures together to tell a story comes naturally to us and "mirrors the process by which human beings come to know their world, better than does any other imaginative experience" (283).

Words and pictures take turns, cooperate with or oppose each other, or influence each other's meaning in the progress of a picturebook. Lawrence Sipe says, "we interpret the text in terms of the pictures and the pictures in terms of the texts in a potentially never-ending sequence" (Sipe, "How Picturebooks Work" 122). Using a vivid simile, Scott McCloud says, ". . . words and pictures are like partners in a dance and each one takes turns leading" (156).

Looking to science for similar concepts of complementary systems to model the fluctuating relationship of the words and pictures, Sipe uses the analogy of synergy to illustrate how words and pictures augment and depend upon each other ("How Picture Books Work" 98-99). And borrowing useful terms from biology, David Lewis talks about the "ecology" of the picturebook and the symbiosis or "mutual interanimation of words and pictures" (36).

 Scholars reflecting on the reciprocity of words and pictures maintain that each is as important as the other, each playing an essential role in conveying story, and both made all the richer by the presence of the other. Schwarcz (4) says words and pictures create "a common fabric" and a "context" for each other (4). There is also a notion of the yin and yang of words and pictures, or mutual completion, expressed by Nikolajeva and Scott as "fill[ing] each other's gaps . . . [and] compensat[ing] for each other's insufficiencies" (139), and Nodelman's "each speaks about matters on which the other is silent" (221).

Picturebook specialists have also theorized that words and pictures operate in the different spheres of space and time, that words are lineal and temporal, and images spatial. "Language discloses its contents in time . . . . The picture, on the other hand, confronts the viewer all at once . . . [and] we see its contents simultaneously . . ." (Schwarcz 9). Like Schwarcz, Nodelman and Reimer say that words convey time because they are read one after the other, and pictures can only describe space because they are perceived all at once (277).

But, as an illustrator and a student of art history, I think the idea that images are seen all at once, particularly those which fall into the category of narrative art, is facile. From the Bayeux Tapestry to stained glass windows depicting the life of Christ, to Hogarth's *A Rake's Progress*, and many, many paintings depicting historical, mythological and religious events, complex images require study over time. As well, there are basic composition techniques every artist learns which combine the effects of the colour, size, line, position on the canvas, etc. to establish degrees of salience and to create paths that encourage the viewer's eye to take a sequential journey. Picturebook illustration, in particular, can be an information-dense art form. I'm not alone in believing that, while it's true that simple images, which nonetheless can be immensely powerful, could be said to be seen all at once, many of the images in picturebooks need time in order to uncover the many messages— aesthetic and narratological—that they contain. In his book, *Understanding Comics*, McCloud points out that complex illustration is not looked at as a whole, but is often read from one side to the other. "After all, it does take an eye time to move across scenes in real life" (97). Taking time to examine a picture is especially true of children who look at book illustration carefully to uncover all there is to be seen in the picture. Kiefer points out that in looking for what one teacher calls "secrets" (36) children do see more details than adults, including "the smallest details that many illustrators include in their pictures and that we adults often overlook" (35). Arizpe and Styles conclude from their study on how children read picturebooks that "the eye moves between one part of the picture and another, piecing together the image like a puzzle" (201). None of these processes are "all at once" activities.[5]

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[5] But, in *Words about Pictures* on the same subject, Nodelman can be confusingly subtle. In chapter seven he says, "We first experience a picture all at once, a glance taking in the whole image, and theoretically we have no way of determining what in it might have caused what else in it. . . because words are necessary to interpret an image." But, later, as if running to the other side of the chess table he says, "the idea that words are merely lineal and pictures merely spatial is extremely simplistic" (199). Finally he synthesizes these two positions when he says that pictures can convey story but that it is actually a verbal process "trying to understand the situation a picture depicts is always an act of imposing language upon it—interpreting visual information in verbal terms" (211).

In recent years, the wordless or nearly wordless picturebook has become increasingly sophisticated, which problematizes the view that pictures need words to tell stories. The narrative capabilities of sequential images in wordless books like Quentin Blake's *Clown* are, arguably, as clear as in a written narrative.

2.2   The Mechanics of Word-Picture Interaction

In general, words and pictures collaborate to create story in three ways: enhancement, in which words and pictures each fill in different details; alternation, where words and pictures tell the story in turn; and contradiction where there is a lack of agreement between the two modes. Contradiction often creates humour or irony, or reveals an unreliable narrator as seen, for example, in Jon Klassen's *This is Not My Hat*. Oliver Jeffers uses alternation in a sequence in *The Heart and the Bottle* in which the girl draws a picture on one page (image only), runs to show it to her grandfather on the facing page (image only), followed by the mutually enhancing words and images of ". . .until the day she found an empty chair." The sequence is concluded by an image-only page of the girl sitting in darkness in front of the same empty chair; the visual clues of going from day to night tell us that she has been waiting for a long time. This sequence shows that alternation and enhancement, while not as sophisticated as counterpoint, can be very powerful.

Schwarcz suggests nine kinds of word-picture interaction. I would gather his categories of *congruency*, *elaboration*, *specification*, *amplification*, *extension*, and *complementation* under the umbrella of enhancement; his *deviation*, and *counterpoint* as forms of contradiction; and agree that *alternation* (16-18) stands on its own. What I call contradiction, Nodelman calls irony, and Nikolajeva and Scott call counterpoint (17). Nikolajeva and Scott further divide counterpoint into subcategories not necessary to summarize here.

Perry Nodelman goes to the point of saying that, "all the relationships between words and pictures are ironic" (227), but this tends to overlook the way that words and pictures in most

picturebooks operate through mutual enhancement, counterpoint being the most sophisticated and most difficult relationship to pull off. As Sipe points out, "this definition of irony is so broad that it becomes slippery" ("Revisiting" 9).

Salisbury and Styles note that counterpoint is most successfully achieved when author and illustrator are the same person (24). But, no matter what this meaningful disagreement is called, the effect is extremely subtle and complex, while probably being the feature most overlooked by those with a strictly instrumental view of the picturebook.

2.3   How Children Read Picturebooks

Integral to the discussion of the relationship of words and images in picturebooks, are observations on how these books are read by children. Serendipitously, for both the maker of picturebooks and the children who read them, suspense is built into the form in "the drama of the turning page" (Bader 1). Dramatic pacing is also inherent because of the push of words versus the pull of pictures:

> In forming a plot, a sequence of events that is not yet ended, the text of a story leads us forward. In showing how things look at one moment and asking us to dwell on them, the pictures hold us back. The rhythm of picture-book stories is a continual move forward and then stop. (Nodelman, *Words about Pictures* 261)

While Nikolajeva and other researchers have posited that children need to learn how to read picturebooks (Nikolajeva 27), others have said that children naturally tell and respond to stories multimodally. Scott McCloud says that children start out using words and pictures interchangeably. "It's considered normal in this society for children to combine words and pictures, so long as they grow out of it" (139). Duncum says this can be seen when children show their drawings and "use words to help carry the visual narrative or to anchor the meaning of [their] images" (258).

One of the features of reading picturebooks is the way children move from words to picture and back again, all the while constantly revising their understanding of each. Sipe writes that, "we interpret the text in terms of the pictures and the pictures in terms of the texts in a potentially never-ending sequence" (102). Hermeneutic analysis, or the process of changing what we know in light of what we have learned, is also described by Nikolajeva and Scott to be characteristic of the way a child plays a picturebook (2).

We can conclude from the above discussion that picturebook reading is not linear. In addition to circling from words to pictures on a single page, children like to page backwards and forwards in order to make sense of the story in an "impulse to be recursive and reflexive in our reading of a picture book" (Sipe, "How Picturebooks Work" 101). This is an aspect of picturebook playing particularly relevant to the interactions, sounds, and animations of the picturebook app, which have been criticized for discouraging linear reading. This criticism reveals a misunderstanding of not only the app, but of how a child plays the codex picturebook.

The role of the body in picturebook scholarship has been largely overlooked except for the presumed use of the eyes to see and the ears to listen to a read-aloud, although physical interaction is implied in Bader's oft-quoted "the drama of the turning page" (1). Mackey's exploration of physical engagement in playing the text explains how the body participates in all reading ("Handling the Text" 110-131). Using the body with the picturebook app is therefore not the departure from reading that some critics fear it is.

In Mackey's discussion of the role of the hands and the body in reading, she anticipates the debate over interaction and whether it interferes with reading, Mackey reminds us that reading is not just an intellectual experience divorced from the body:

> We need to ask whether the activity of the hands is simply a superficial accompaniment of
> our current arrangements for reading, whether the role of the hands is confined to the

aesthetics of the tactile elements of reading, or whether the use of the hands engages the

brain in ways that play a constitutive role in the reading processes. (Mackey 113)

Frequently, when discussing how children read picturebooks, scholars, such as Arizpe and

Styles, place the word "read" inside quotes to draw attention to the word's inadequacy for describing

the process of looking at a picture, and for searching for the correspondences and disagreements

between it and the words. They question whether *read* is the right verb for the hermeneutic cycling,

puzzling, looking at pictures, and reading words that the picturebook form demands of children.

Kiefer is one of the scholars who places "read" in quotes (10) when describing the process of

looking at visual texts, and Reid-Walsh uses the hyphenated term "child reader-viewer-player"

(165). Margaret Mackey suggests the verb *play* to encompass the range of ways information is taken

in and responded to in a picturebook (172). Using *play* for picturebook reading troubles the popular

criticism that the picturebook app is too playful to be a literary text.

2.4   The Picturebook as Multimodal Text

In this section, I look at scholarship useful for developing a lens through which to examine

the additional modes of sound, animation, and interaction found in the picturebook app, and I am

adopting Sipe's view that the relationship of words and pictures is a multimodal one: "Picturebooks,

even the most traditional, are by nature multimodal" ("The Art of the Picturebook" 248). The use of

the inclusive term of mode to stand for both words and pictures will help to extend picturebook

scholarship's insights on the relationship of words and pictures to include the picturebook app's

modes of sound, interaction and animation.

In her book, *Working with Multimodality*, Jennifer Rowsell looks at multimodality in the

contemporary creative practices of a number of Canadians and points out that "combining modes is

becoming more common" (4). This includes transmedia productions such as television shows with

their own web and social media sites; the *New York Times Online*, which replaces editorial cartoons with animated gifs and includes video with reporting; and pdf instruction manuals, which contain video and audio as well as the traditional text, illustrations, and schematics of earlier manuals. Duncum notes that "all cultural sites, but especially ones like television and the Internet, include a range of modalities, especially language, images and sound . . . multimodality" (253). Looking at the picturebook app in this light, it's easy to see that introducing more modes to the picturebook format is part of a larger trend in communications.

Rowsell talks about balance between modes and suggests that the question of which mode predominates in a multimodal production may be more a matter of creative "orchestration" (6). She points out that combining modes means bringing together people with different expertise, making collaboration inevitable (7). This very important demand of producing multimodal works of quality is well known to creatives in film, theatre, and children's publishing. However, artistic collaboration seems less prevalent in many of the children's books and apps which have come onto the North American market in the current climate of self-publishing. These do-it-yourself efforts often give short shrift to sound, design, editing, and translation.

2.5   Play and Puzzles in the Picturebook

Recognition of the importance of play in childhood development is not just a contemporary enthusiasm in children's education. Reid-Walsh (as well as Kiefer 16 and Madej 5) quotes John Locke from *Some Thoughts Concerning Education* on his belief that children learn best through play to support her view of "the value of literacy play as a wide-ranging activity" (168).

The fun and funny kind of play in picturebooks is a well-established and acceptable way to engage children. This is done with humorous art, story twists and reversals, surprises, and language play including jokes, nonsense words, rhyme, rhythm, tongue twisters and punning. Even metaphor

and simile can be seen as forms of play (Kanatsoulis 35-36). "The relationship between literature and play in children's fiction always exists . . . due to the child's need to play, experiment, and try new things" (Kanatsoulis 33).

Another form of play associated with children's books is when children imagine themselves playing in a fantasy world inspired by books. Kanatsoulis says that fantasy play indicates a growing understanding of story structure, arguing that "in this game of roleplaying . . . [the child] learns to trust the fictional world" (Kanatsoulis 34). Mackey reminds us of how children say, "playing make believe" (166) when referring to fantasy play.

2.6 Animation and Movement in the Picturebook

Picturebook scholars have also noted the way animation, in the form of movement through space and time, has been implied, described, or visually represented in the picturebook. Movement and animation, or what Burn and Parker call the kineikonic mode (71), have been discussed by a number of picturebook scholars. Schwarcz (23-33), Nodelman (222-233), Nikolajeva and Scott (139-172), Bang (22-73), Van der Linden (102-120), and McCloud (88-114) all devote sections in their books to how artists have represented movement in the still image. Some of the strategies that have been employed to suggest movement and animation include:

- Visual clues to the passage of time: "pictures of clocks or calendars, of sunrise and sunset, or of seasonal change . . . [or] a sequence of pictures . . . [together with] the verbal text serve . . . to reveal time's progress" (Nikolajeva and Scott 139).

- Composition: "any picture that emphasizes the diagonal—whether with shapes or colors or light or any structural element—is dynamic, because the diagonal implies movement or tension" (Bang 47).

- Comic book conventions such as motion lines (zip ribbons) and figures blurred and distorted as if by speed (McCloud 110-114).

- Depictions of mid-action and unfinished movement, such as a foot in mid-step or an object depicted in mid-fall. Molly Bang explains that this is convincing to us because, "we see pictures as extensions of reality. When we look at a picture, we 'read' it as though gravity existed inside the picture as well as outside" (60). Van der Linden says that depicting a slice of time in an action existed in art long before photography and calls it *l'instant quelconque* (103).[6]

- Pregnant moment[7]—a technique which compresses all the essential stages of an event into a single image, so that its unfolding occurs as the eye travels across the page. Van der Linden illustrates this concept with a picture from Tomi Ungerer's *Tremolo*,[8] which shows the cause and effect of a comically catastrophic chain of events (102).

- Sequential repetition of a single character in one illustration to represent consecutive stages of movement. Van der Linden (105-107) adopts Nikolajeva and Scott's term, *simultaneous succession* (140-45). Schwarcz calls this *continuous narrative* (22-33), a term Nodelman adopted. Schwarcz points out that the reason we know there is only one character in multiple stages rather than multiple identical characters is because the illustration exists in the context of the text (33). However, we can see from wordless books, such as Zullo's 2012 picturebook, *Little Bird*, that the technique of continuous narrative can be used effectively without words.

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[6] *L'instant quelconque* roughly translated as "any moment" means a slice of time in an action.

[7] *L'instant pregnant*: "*S'attachant à traduire l'essence d'un événement par une image en concentrant toutes les caractéristiques essentielles*" (Van der Linden 102).

[8] Called *Tortoni Tremolo the Cursed Musician* in English-language editions.

- "the drama of the turning page" (Baden 1) is such a strong animated element and so

  suggestive of the unfolding of a story that it can imply the passage of time or change of

  scene, similar to an ellipsis in text, a fade to black in film, or a curtain fall.

- The propulsion of a "travelling book" (Doonan 66) in which the action moves from left to

  right across each spread and continues from page to page.

2.7   Sound

So far, there is little literary or aesthetic analysis of picturebook apps, and thoughtful

discussion of additional modes, including sound, rarer still, so it is useful to extrapolate from

scholarly writing on audio books, sound in film, and texts on multimodality. As in film, the aesthetic

and sophisticated multimodal use of sound in an app can support and deepen narrative.

While a significant number of picturebook apps have been published since the introduction

of the iPad in 2010, only a tiny percentage of these show any of the multimodal complexity of the

best picturebooks. Even fewer fully exploit the multimodal potential of sound. Sound effects are too

frequently literal rather than metaphorical, and do not interrelate with other modes to create

narrative. Like the interaction of pictures with words, sounds can be literal, mirroring what is

described in the text or shown in the pictures and animations; in sync with other modes but

amplifying them by supplying details that they don't; or they can contradict the other modes for

ironic effect or to cast the words and pictures in a new light. An example of this kind of counterpoint

between sound, image, interaction, and words can be seen on the cat-haircut screen in *The King's

Ears*, where each snip of the scissors makes the cat look more ridiculous. But throughout its haircut

the cat continues to purr, a feline sound of happiness. This counterpoint of increasing

unattractiveness coexisting with inner happiness contrasts with the king who is so unhappy with his appearance that he has made himself a prisoner in his own castle.

Stichnothe tells us:

The use of sound is something truly unique to both book apps and e-books. Audio elements add a new layer of meaning to the text. The function of these elements can be to intensify the emotional impact of a scene, to provide a fitting background atmosphere, or to create or increase suspense. (3)

While her description of the function of audio elements is true, it is important to recognize that sound has always been implicit in the picturebook.

2.7.1   Musical Language in the Picturebook

Because the picturebook is meant to be read aloud, the sound of words has always been implied in the codex and actualized in the mind's ear or in reading aloud. Authors are extremely conscious of the importance of the musical and rhythmic qualities of their language as they write, and their creative process often includes reading aloud as they compose. Writers for children know that if their language comes alive when read aloud through its rhythm, sonority, excitement and/or humour, it will help children become readers. "The skilled picture book author is a master of prosody, capturing rhythms and stresses within simple sentence structures, producing language that lends itself to being read aloud" (Heald 233).

Heald talks about the response of the body to picturebook language and asks, "How can we tell that the part of the brain centered on music is stimulated through the language of picture books? To an educator like myself, it is seeing rhythm travel through a child's arms and legs when hearing words from a story . . ." (228). Like Heald, Mackey talks about how this mode engages the body, underlining that playing the picturebook is a whole-body experience (131).

2.7.2 Representing Sound in Picturebook Image, Layout, and Design

Illustrators conjure sound in the mind of the reader with composition, colour, and by picturing objects that make sounds, representing noise-making creatures and things in the act of speaking, mooing and bellowing. Designers enhance this effect in the way they lay out typography in orderly or chaotic waves, rays and splotches, and in combination with variations in the font's colour, intensity, and size. Schwarcz devotes a chapter to sound in picturebooks and points to the way illustration has been influenced by comics (77). Some illustrators put sound words in the art, influenced by comics where *bang*, *crash* and *pow* appear inside bright exploding stars in action scenes. Along with putting words to denote sound in the images, picturebooks illustrators have also adopted what Scott McCloud calls zip ribbons or action lines, which radiate from an object and can indicate not only sound, but smells, radiation, and mysterious mojo (129-131). An example of both words and motion lines in the art can be seen in *The Trouble with Dad* by Babette Cole. McCloud also talks about how colour has been used by artists to represent sounds and moods, such as using red to signify loudness (123).

Two examples of picturebook artists interested in representing sound are Chris Raschka and Dušan Petričić, both of whom use the painterly qualities of colour, shape, and transparency to represent sound. Raschka, a lover of jazz, has an ongoing series of picturebooks celebrating the music of American jazz greats. In *Mysterious Thelonious* he uses a synesthetic approach, creating a parallel system of colour and shapes to represent the notes, intervals, chords, and scales of the musician's famous composition, "Misterioso."

In *The Man with the Violin* written by Kathy Stinson and illustrated by Dušan Petričić, transparent watercolour waves wafting through hurrying commuters in a crowded train station

represent the sound created by incognito violin virtuoso Joshua Bell (about whom the book is written). The images make visible the uncanny penetration of beautiful sound in a great hall.

Sound recordings began to accompany picturebooks as add-ons as soon as technology allowed. First tapes, then CDs were packaged with books, turning the picturebook-sound package into what Mackey calls a "polysemic work" which offers a "further channel for meaning. . . . rather than recreating an element already present in the print text" (130).

2.7.3   Sound in Films and Audiobooks

Animated adaptations of picturebooks have shown the importance of sound in film. It has been fruitful to look at the very faithful picturebook adaptations by Weston Woods. For example, their film of William Steig's *Doctor de Soto* (a personal favourite) with its very high quality and artistic sound demonstrates the value of a well-acted, professionally recorded narration and other sounds. Van Leeuwen's discussion of sound in films helped me to organize picturebook app sound into the categories of music, soundscape, narration, effect, and voice.

In *Speech, Music, Sound*, Van Leeuwen discusses the semiotics of sound in film and its multimodal, frequently contrapuntal, relationship to the moving image, much of which is extremely valuable in a discussion of sound in the picturebook app. He writes that sound can take precedence over what the eyes see and suggest inner truth or subtext, such as a menacing soundtrack making a smiling character appear to be a liar with a hidden agenda (10).

Valuable tools for thinking about picturebook app narration can be found in Van Leeuwen's chapter "Perspective," which talks about quality of voice and how it and the way it is recorded can portray physical and social distance between the speaker and the listener. For instance, a whisper suggests closeness both physically and socially and can be recorded in such a way as to be audible against the sound of a full orchestra (27). An example of an appropriate vocal perspective is Helen

Bonham Carter's narration for *The Heart and the Bottle* and her choice of a soft, intimate voice to tell a story about death and grieving.

Soundscape is another filmic feature, which can be transferred to the picturebook app. Van Leeuwen explains how effective the artistic layering of background sound can be in grounding the images and texts in reality (2-3). It is used in many scenes in *The Heart and the Bottle* to great effect. I put in soundscapes wherever possible in *The King's Ears* and was amazed at how they made screens come alive. One standout example is how a beautiful recording of a meadow with sounds of birds, insects, and sheep that I downloaded from *freesound.org* anchored and enriched the meadow scenes in the app.

Like Van Leeuwen, Leilani Clark talks about how audio can add meaning to the picturebook: "Audio encourages different skills. It can be fun to listen to, and requires an emotional and sensual engagement, as well as some understanding of how sound can signal meaning" (1). Her article, which centres on an audiobook adaptation of *The Cat in the Hat*, describes how music can frame scenes and signal opening and closing of the book, a device I subsequently used in *The King's Ears*.

The audiobook can deliver sounds that the picturebook can only imply. Great narration, atmospheric music, and the way sounds can anchor words in reality can make the story live for children. Clark comments that the emotional content of words and pictures in the picturebook "is only intimated, whereas it is necessarily actuated through performance" (Clark 6).

Sound in the audiobook and animated adaptations of picturebooks provide useful tools for evaluating sound in picturebook apps, and provide standards of professional excellence.

2.7.4   Sound in Apps

The value of sound in multimodal artworks cannot be underestimated. Rowsell comments that sound's importance is growing because of the web and because of its influence in so many media:

> Though sound has taken a backseat to visuals and language for a long time, its role is ascending with the popularity of the web and the predominance of sound-based texts. Like visuals, words, and film, sound is a vast mode, cutting across many disciplines, cultures, and epistemologies. (Rowsell 32)

In the picturebook app, sound can work with images to enhance or contradict in the same way that images and words interact in the picturebook. In addressing sound in the picturebook app, Stichnothe points out: "Audio elements add a new layer of meaning to the text. The function of these elements can be to intensify the emotional impact of a scene, to provide a fitting background atmosphere, or to create or increase suspense" (3).

In the world of picturebook app publishing, the quality of narration ranges from amateur to studio-recorded movie actors chosen both for their star appeal and the quality of their work. Apps with narration in multiple languages often only use a quality performer for the native language and someone less talented for the foreign language track, as if children listening in other languages have less discernment or need to be connected to the narrative through the spoken word. Clark's explanation of the importance of the right narrator in audiobooks can be extended to the picturebook app: "the choice of the reader/actor is a crucial issue. The voice, through attributes such as accent, timbre and pronunciation, will be associated with class, nationality, sex, ideologies and other social markers and so may work to include or exclude audiences" (7). Both Heald and Clark agree on the importance of the quality of narration: "Spoken inflection can make or break a child's response to a picture book in the same way that performing a piece of music without regard to phrasing can put an

audience to sleep" (Heald 232). An example of an excellent home-language narration with a poor

narration for the English translation is Paloma Valdivia's *LittleRed App,* narrated in Spanish by the

great Chilean actor Maria Izquierdo, but only indifferently narrated in English.[9] An example of equal

care being taken with the narration and translation of a multi-language app can be found in *The*

Voyages of Ulysses (Elastico).

In an article on meaningful noise in computer games, Ekman states that, "sound is often . . .

mere decoration . . . many games are fully playable with the sound turned off. Compared to the

extensive use of visual information, sound remains an underused potential" (1). Yet among the

desirable picturebook app features listed by reviewers is the ability to turn off the sound (Bircher

74). For the designer of the picturebook app who has created integral or meaningful sound, the

option to turn off the sound is akin to the option to turn off the pictures, and shows that reviewers

and most designers have not cottoned onto the picturebook app's potential for meaningful

multimodality.

While not everyone agrees that sound is underexploited in videogames (Rowsell observes

that sound can dominate the visual in videogames (88)), I believe that Ekman's comments could

definitely be applied to picturebook apps. Ekman's term *meaningful noise* to describe sounds that

deepen, inform, and complement other modes in a computer game (1) is equivalent to Stichnothe's

term *integral* to signify sound that supports narrative and interrelates with the other modes in the

picturebook app in the same way that words and pictures are interdependent in the picturebook.

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[9] Sadly, the same can be said of the translation into English of the poem by Gabriela Mistral, who won the Nobel Prize for literature in 1945.

2.8   Interaction in Picturebooks

From a literary standpoint, books with interactive features have often been dismissed as novelties, and their value in encouraging children to read frequently overlooked, "interactive books [are] too-often relegated to 'toy book' status" (Taylor and Bluemel 21). But others believe movable books can "help children build bridges to more mature cognitive and language abilities necessary for tackling reading and writing," and have created useful bibliographies of pop-ups of quality (McGee and Charlesworth 854).

A literacy philosophy which holds that reading books must be an intellectual activity and that playfulness only happens in the mind, could, according to Franceschelli, result in a distrust of books with "creative physical components" (qtd. in Parrott 1). But playfulness and interaction in themselves should not exclude a book from consideration as a literary artwork; these elements may actually require a higher level of analysis on the part of the player because of the increased number of modes involved. Mackey calls the kind of strategic play demanded by a book with movable parts as "remediation . . . [a process which] involves an oscillation between looking through and looking at the text" (16). In other words, strategies must be found in order to follow the narrative.

Close readings by both Dresang (50) and Kanatsoulis of Maurice Sendak's pop-up book, *Mommy?*, in which a child searches for a mother who is part monster, demonstrate how the often-undervalued movable book can be both literary and meaningful and, in this case, the very playfulness of the interactive mechanisms helps to deconstruct monsters and dispel the child's fears (Kanatsoulis 38). Other movable books of high literary quality with integral interaction are the pop-up version of Jeffers' *The Incredible Book Eating Boy*, *The Jolly Postman* by Janet Ahlberg, and a 1983 pop-up version of *Peter Rabbit* published by Frederick Warner (Potter).

On her website devoted to the pop-up book, Rubin tells us that picturebooks with movable parts began to be produced towards the end of the 18th century, and mass-produced in great numbers

by the end of the 19th. Like our own period, the popularity in the Victorian age of the interactive book-toy hybrid was a time of the "convergence of book and toy technologies and cultures" (Hateley 1). Drawing parallels between these two periods gives the picturebook app a historical context, allowing us to not only see the digital picturebook relative to the rise of the movable book, but also allows a re-evaluation of the movable book (Reid-Walsh 165).

Literacy and technology have gone hand in hand through history. In *Literacies across Media*, Mackey tells us that "Literacies are grounded in a complex world of social custom specific technologies, and change in literacy tools and equipment is not new" (165). The picturebook as a physical object has evolved over time. Kiefer says that while it has changed since its inception due to social and cultural factors, technology has changed the picturebook the most ("What is a Picturebook" 19). Hately gives a specific instance of how technology can effect a transition from movable book to picturebook app with Loud Crow's *Pop Out! The Tale of Peter Rabbit:* "[it] offers digital equivalents of tabs and spin wheels from movable books of the past" (8).

Part of the reaction against picturebook apps arises out of what Erica Hately calls "the romance of reading" (2). She introduces the concept of metareading—reading about reading—and notices that this can be seen in a number of children's books and picturebook apps, such as Roald Dahl's *Matilda*, Oliver Jeffers' *The Heart and the Bottle*, *The Incredible Flying Books of Mr. Morris Lessmore*, and Lane Smith's *It's a Book*. Hately observes that the romance of reading is centred on the codex to the point of fetishization (6), even when it occurs in picturebook apps, and remarks that "the determined absence of digital culture from these . . . picture books [and picturebook apps] about reading seems to locate them within current adult anxieties about children not reading books" (5).

Both the pop-up book and the picturebook app have been criticized for being more about spectacle than reading, with too little text and too much to merely marvel at. Part of the disparaging attitude towards interactive paper and digital books may be a distrust of play and the use of the body

in reading. Adapting Mackey's suggestion to call picturebook reading *playing* might lessen misgivings about the pronounced playfulness of the picturebook app.

2.8.1   Movable Book Interactive Mechanisms Converted to Digital

The first picturebook apps released in the App Store leaned heavily on previous formats such as the short-lived CD-ROM, and had many of its features including narration, music, sound effects and the choice to click on words to hear them repeated, as well multi-language options (Madej 9). Schwebs says, "apart from the gyroscope and the finger-controlled user interface, most of the Living books [CD-ROMs] features are still found in today's apps for children" (3). The first apps also referenced the movable paper book, supporting Scott McCloud's observation that, "each new medium begins its life by imitating its predecessors" (151).

In tracing the history from picturebook to picturebook app Kimberley Reynolds argues that picturebooks "anticipate ideas about narrative structure and organization that have come to fruition in electronic texts—such . . . as interactivity" (38). She observes that this influence is currently going both ways, and there are more new picturebooks with low-tech interaction, as well as showing an awareness of new media in the content and design. "[P]icturebook makers are referencing and drawing on characteristics of new media at the levels of narration, design and the text-reader dynamic in ways that recall the modernists' excitement about machines, new technology, and the future of culture" (38). Lane's *It's a Book* would certainly be an example of this kind of cross-influence.

It is interesting to examine the specific mechanisms from movable books which have been translated to the gestures and mechanics in the iPad app. The reveal-and-hide accomplished by turning a paper flap has been translated in the app to touch to hide or show as a way to find out what's behind objects on the screen. The translation of push- and pull-tabs can be seen by comparing the movable book (see fig.3) and app versions (see fig. 4) of *Bizzy Bear: Fun on the Farm* where pushing tabs make hungry pigs rise above a gate to beg for apples, or open doors to see the chickens
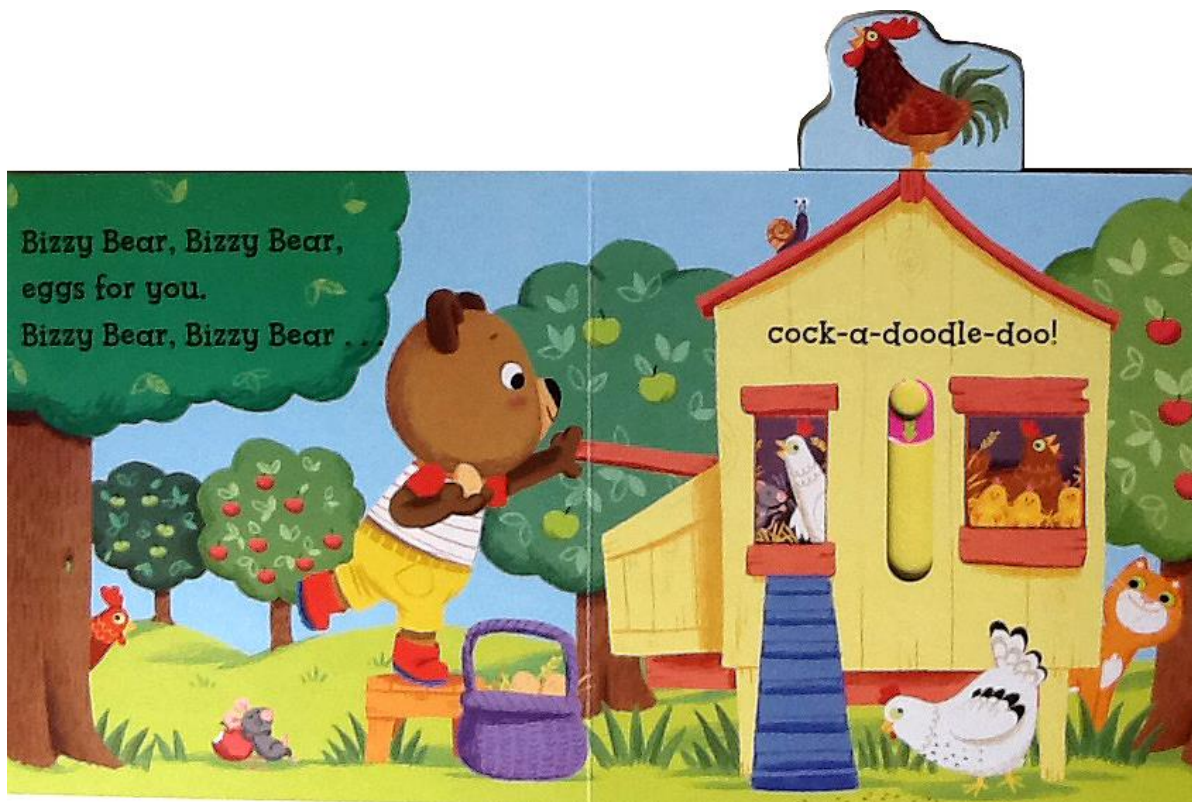
Figure 3. Push tab in the *Bizzy Bear* board book.
in the henhouse.

Figure 4. The *Bizzy Bear* app has digital sliders in place of push tabs.

As the picturebook app matures, interaction mechanics arise which are inspired by the characteristics of the iPad. Examples of creating something not seen in the print world are *Metamorphabet* by Patrick Smith, *Petting Zoo* by Christoph Niemann, and *Nighty Night* and *Little Fox Music Box* by Heidi Wittlinger. These creators have overcome the considerable technological and financial barriers to move from imitating an older technology to the creation of picturebook apps that exploit the affordances of the medium itself. These apps all pay close attention to beautiful and integral sound and are technically and artistically innovative, while at the same time encouraging interaction with a spirit of playfulness and experimentation.

2.9   Conclusion

In this chapter, I looked at picturebook scholarship devoted to the dynamic relationship between words and pictures and how children apprehend narrative in this unique literary art form. Specialists such as Nodelman, Sipe, and Nikolajeva and Scott describe the dynamics of word-picture interaction and use different metaphors to illustrate the ways in which words and pictures interact, change each other, and take turns in telling story. Mackey has added depth to the understanding of how children interact with books with her illuminating expansion on the definition and importance of play and the role of the body in playing the text. I have discussed how interactive books and apps have often been dismissed as novelties in the belief that reading is a purely intellectual activity, but scholars like Margaret Mackey suggest that the body, especially the hand, may open pathways to the brain that enriches playing a picturebook. Like Mackey, I believe that using the hands helps to activate the brain and release creative thought. It may be that instead of interrupting story engagement, interaction in the picturebook app may serve to bring the reader more fully into it.

Looking at picturebook scholarship for ways to view the picturebook app has revealed that the modes of sound, animation, and interaction have always been present in the codex and did not suddenly appear with the picturebook app. However, for a fuller understanding of these modes, and the language to talk about them, I also looked at literature about sound in film and children's audiobooks, multimodality, movable books, comics, and shared reading.

Using this scholarship as a base, I will show in the following chapters that sounds, animations and interactions are not necessarily distractive and diversionary, as some critics would have us believe—neither as a single occurrence nor because there are more than an arbitrary number of them on the screen—but can meaningfully interanimate to produce a meaningful and whole multimodal narrative.

I hope to trouble the prevalent mindset that a picturebook can only be words and pictures and that the introduction of more modes to the picturebook is a distraction that interferes with the act of reading.

Chapter 3: Guiding Design Principles for the Creation of a Picturebook App

3.1 Introduction

This chapter lays out a six-part framework for designing picturebook apps, which emerged from a review of picturebook scholarship, as well as the practice of applying those ideas to designing the picturebook app, *The King's Ears*. The method employed in this inquiry is Design-Based Research (Design-Based Research Collective 5), a nascent research paradigm that takes into consideration context and everyday issues of practice in the development of new technologies and learning environments. As such, my process included iterative cycles of design, enactment, analysis, and redesign to develop an original media artifact, as well as sharable theories that can inform the work of other designers.

Three important concepts foreground this inquiry. The first and most important one is that a *picturebook story is played multimodally* through the combined contributions of words and pictures. Shaping the app's modes of sound, interaction, and animation to interrelate with the words and pictures and with each other to tell the story was the central challenge of the app design. The second significant idea that governs this design-based approach is that *children read picturebooks differently than adults* do. The third principle grows out of the first two: playing a picturebook is a personal experience characterized by each child's particular puzzling, paging backwards and forwards, and hermeneutic cycling. Therefore, interactions, sounds, animations, and navigation of the picturebook app should be *child-controlled and replayable*. In subsequent sections, I will illustrate how these concepts developed into six questions which can be used to test the design and/or assessment of picturebook apps.

3.2   Integrated Modes to Tell Story - Picturebook Theory Applied to the App

In the previous chapter, I reviewed the picturebook scholarship which explains how words and pictures can work together to tell a story. Lawrence Sipe calls picturebook words and images modes, and the picturebook a multimodal form ("The Art of the Picturebook" 248). He talks about how children read the picturebook by cycling through words and pictures hermeneutically (*Storytime* 189). These concepts can be extended to guide the integration of the modes of sound (music, narration, effects, and soundscapes), interaction, and animation in the picturebook app in order to ensure they are also integral to the story and not merely ornamental. The dynamic of word-picture interanimation is the fundamental principle of picturebook scholarship, and making interactions, animations and sounds tell the story in concert with each other and the words and pictures was the main thing I tried to do in this app. It required a great deal of thought and challenged my creativity. An example of the use of a number of modes to tell the story is at the beginning of *The King's Ears*. On the first story screen (see fig. 5),[10] we see King Boyan looking miserable from his position squashed inside a picture frame. His constant companion, the bird, perches on the frame. The modes of this screen include:

- reading the text, "King Boyan never left the palace" (same as the codex)

- looking at the picture (same as the codex)

- looking and listening to the animated hint of the bird ruffling her feathers (new)

- listening to the text being narrated by Terry Jones (new)

- touching anywhere on the king and the frame to make the king blink, then cry a single animated tear (new)

- touching again to make him cry another tear.

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[10] A note on numbering the app screens for discussion purposes: The first two screens are referred to as cover and half-title and aren't numbered. The next screen is the start of the story proper and is called King's Ears 2, hereafter KE2. It is followed by KE3, and so on up to KE23.
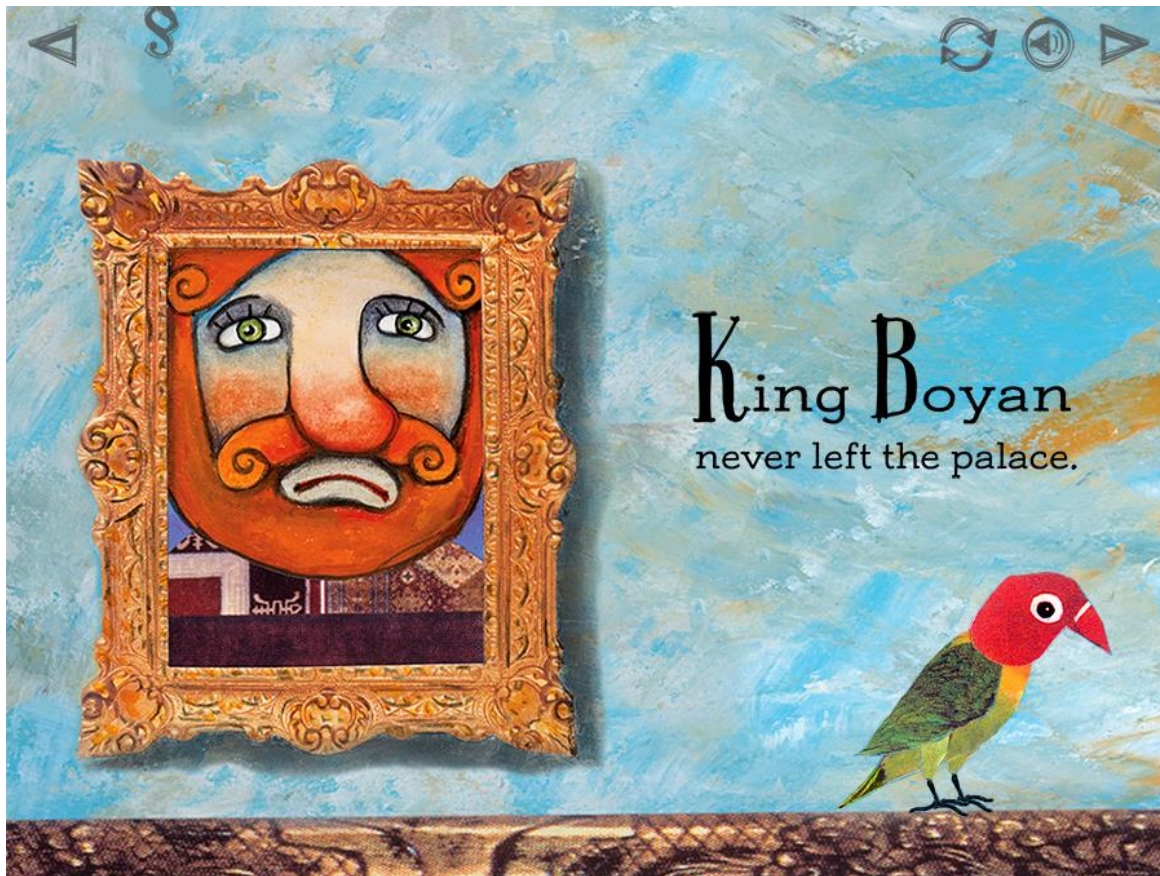
Figure 5. Screen two of *The King's Ears*.

- listening to the sound of the tear splashing into a puddle of tears (new)

- dragging the animated bird to make her fly around the screen, then letting her go to land on the frame or the lower right of the screen (new)

In addition to the words and pictures which tell us that the king is unhappily enclosed in a tight space and the bird is free, the modes of interaction, animation and sound add to the story through enhancement and alternation. Dragging the bird allows the player to experience the happy freedom of flying which is heightened by its juxtaposition with the trapped king. Tapping the king to start the tears encourages empathy and adds depth and nuance to the picture's depiction of the king's unhappy face—it tells us he's sad as well as mad. The sound of the tears splashing tells us that he has cried so much that a puddle has formed below the screen. When the player later reflects on or revisits this screen, which as Lawrence Sipe tells us is likely because picturebook reading is

"reflexive and recursive" ("How Picturebooks Work" 101), new information from the rest of the book will add further depth to the modes of this screen. The player realizes the king is imprisoned by his own fears of being laughed at, and the bird acts as a constant foil—carefree about her appearance and therefore free to go anywhere she wants.

My research made me very conscious of the criticisms levelled at picturebook apps, which often dismissed sounds, animations, and interactions as diversions, distractions, and "bells and whistles." My app, therefore, needed to make sure these modes were integral, and I needed to resist putting in interactions which were ornamental or redundant for the sake of busying the screen. Picturebook scholarship tells us that a great deal can be happening in the mind of a child while contemplating the relationship between a block of text and an image, so a screen doesn't need to be full of activity for it to be rich.

In adapting the picturebook to the app, I was able to not only add additional storytelling modes, but also to take out some word-picture redundancies which exist in the original text. For example, on the codex story opening ten (see fig. 6) when the king first ventures out in his carriage, the heavy curtains that hide him and his ears from view are in both the words and the pictures.
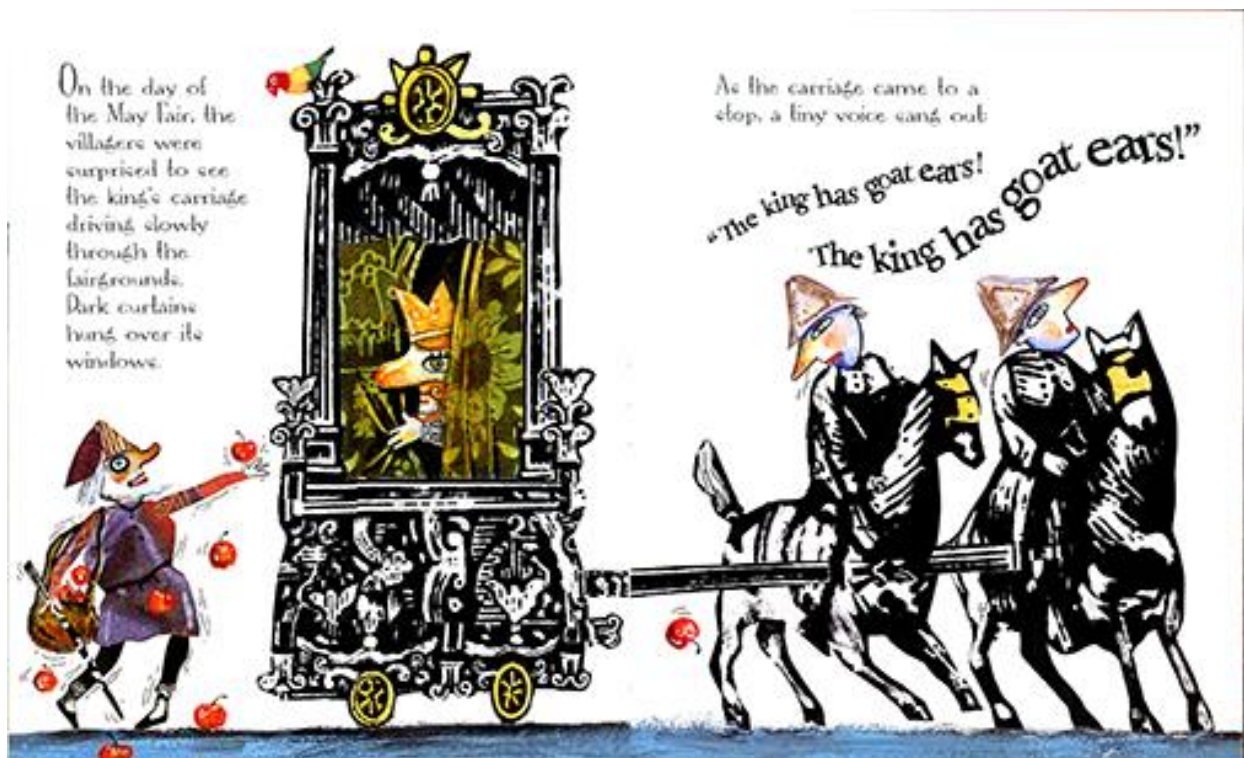
Figure 6. Story opening 10 of *The King Has Goat Ears* (Jovanovic & Béhà).

In KE18, I took the curtains out of the text and introduced animations and interactions which emphasize that the king is hiding behind them. The curtains shake and when tapped the king peeks out and yelps anxiously. I did this to encourage hermeneutic cycling between all modes, not just between words and pictures.

The view of interactions as distractions seems to include the assumption that interaction is just an automatic response to stimuli, even though some interactions in themselves add narrative elements and symbiotically enrich the meaning of other modes. Schwebs tells us that if interactions reveal otherwise unstated aspects of the story and characters they become "prerequisites for the narration itself" (2) and in fact, "strategies of expansion" (8).

On KE5, a barber sits in a pigpen (see fig. 7). The text tells us that the king wouldn't let the barbers leave the palace, and that he gave them different jobs. In many versions of this tale, the king (like the one in *1001 Nights*) kills each barber after his hair has been cut, but in Jovanovic's retelling, all the barbers live. This begs the question: why would the king keep needing barbers until there were none left in the kingdom if his palace is full of them? In mulling it over, I realized the one thing
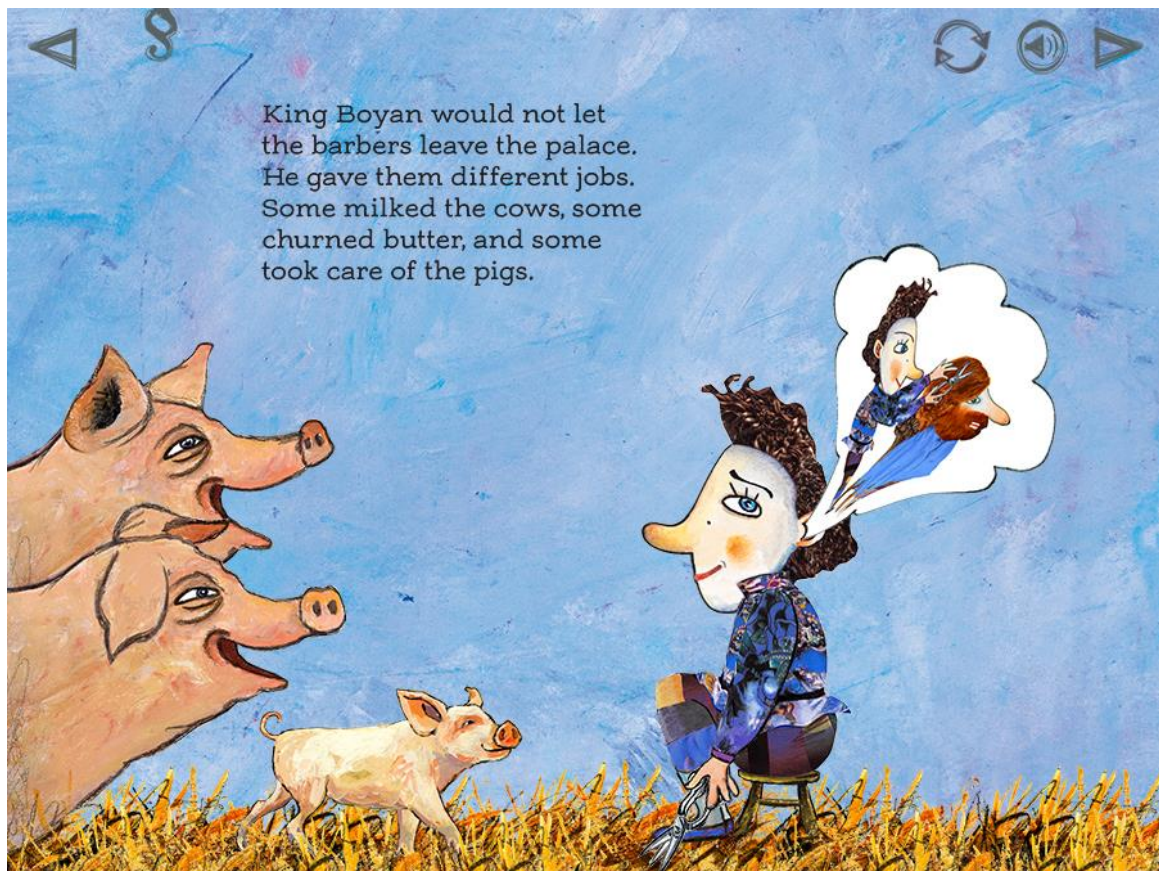
Figure 7. Screen five from *The King's Ears*.

that would prevent the king from allowing a barber to cut his hair again would be if the barber laughed at or was repulsed by his ears. The king would never subject himself to that humiliation again. So, I created a series of animated interactions to fill in that part of the story. Touching the little cloud hint in the barber's ear triggers an animation of an expanding cloud, which contains a wistful memory of being the king's barber, but if this cloud continues to be touched, a series of

images shows how the barber screamed in horror, then laughed at the king's ears until he was dragged off by a guard.

Aline Frederico reminds us that interaction is particularly meaningful when it is used to move the narrative forward. She states: "Interactivity makes uses of the modes to generate playfulness, but a playfulness that depends totally on the reader to unfold, creating participatory narratives which present themselves differently at every reading depending on reader's choices" (134).

Picturebook apps of lesser quality can have a preponderance of ornamental interactions, resulting in a busy app where every object jumps or responds to touch in some way, regardless of its connection to the narrative. Ornamental animations can be seen in the picturebook app, *A Present for Milo*, which is described in the App Store as having "more than 80 tap-interactive objects that initiate more than 125 animations" (iTunes screen). The story is about a cat chasing some pesky mice around the house, not knowing they are leading it to its own birthday party. The player can tap most of the objects on the screen to make them animate or make a sound, such as touching a picture of a boat on the wall to make the boat move inside the frame. Very few of the advertised 80 interactions have anything to do with the, admittedly, slight story.

Children also build up an understanding of the patterns and systems of the interactions of an app as they progress through the story. This knowledge can often be extended to predict the interactivity of not only the upcoming screens, but other apps of that developer, and ultimately to interactive conventions in the format as a whole. For instance, in Nosy Crow's *Cinderella*, the player discovers after the first few screens to keep looking for the always-interactive robin. Players will also be able to eventually predict that in Nosy Crow apps all walking characters and moving cars or coaches on travelling screens can be made to stop, go slow, or run fast. And, all of these same objects can be made to jump and flip somersaults with a flick of the finger.

Madej classifies interactions in the picturebook app as incidental (9), or integral (12). Stichnothe says integral (or meaningful) interactions can create tension between modes, move the story forward, add humour, and show alternate points of view or narrative outcomes (3).

Schwebs underscores that, "the interactivities influence the reading of the story, and such actions are frequently prerequisites for the narration itself" (2). Ideally, this is the kind of multimodal interanimation one would like to see in the literary picturebook app. Others, including Baird and Henninger, see interactivities as add-ons rather than integral to the story and call them "diversions" (Baird and Henninger 4). Like the terms "distractions" and "bells and whistles" (Bird 2) used in most early commentary on the picturebook app, the use of the disparaging word "diversions" seems to imply that additional modes aren't essential to the narrative.

Schons suggests that most picturebook apps are too much like games (127). In her reading of the picturebook app of *The Heart and the Bottle*, she concludes that the activities and interactions are incompatible with a serious story about death and grieving (126), an unintentionally ironic summing up of a book about using the body to express and experience love and grief. But games inside a picturebook app, if well-designed, can be part of the story and a way to respond creatively as the story is played. There are four games or activities in *The King's Ears*.

- cutting the cat's hair (KE7)

- dropping eggs (KE9)

- spelling words with the letters that shoot out of Igor's mouth (KE12)

- making a flute, and composing and recording a tune (KE16)

Each game arises out of the story, but may create an extended pause to its momentum. In my view, these games are very much a part of the world of the story and are related to, if not the plot, then the themes of the story. And, as Yossarian (the fictional character in Joseph Heller's *Catch-22*) points

out when revealing one of his strategies for extending his lifetime, you can make a story much bigger and richer if you go sideways as well as forward.

Like Baird and Henninger, Stichnothe also uses the collective "diversions" for the sounds, animations, and interactions of the picturebook app. A similar view of the diversionary nature of interaction is reflected in the conclusion of the study *Print Books vs. E-Books: Comparing Parent-Child Co-Reading on Print, Basic, and Enhanced E-Book Platforms*: "Parents and preschool teachers should choose print or basic e-books to read with children if they want to prioritize literacy-building experiences over ones intended 'just for fun.'" (Chiong, et al. 1-2).

Bircher's app overview in the Horn Book advises "a successful picture book app is inter-active—but not too interactive . . . too much interactivity can overwhelm or distract from the narration" (72). Both the Bircher article and the *Print Book vs. E-book* study differentiate integral or educational interactions from those which are just for fun, as if these two qualities were mutually exclusive. In this study, I demonstrate that quality picturebook apps can be interaction-rich.

Criticism of picturebook apps is often to do with whether they are believed to serve or hinder literacy, which is defined as learning to read and write in a structured, testable way. Many picturebook app makers and reviewers seem to place the most value on whether the storybook app has features geared to increase fundamental skills such as word highlighting, built-in dictionaries, quizzes, and leveled games because modernist education theory views learning to read as skills-based, and values reading fluency, vocabulary and comprehension (Filipenko). My focus in designing this app is on that small essential space occupied by the literary, multimodal, sophisticated picturebook app. I'm interested in the picturebook (and the picturebook app) as a literary artwork, "a unique art object, a combination of image and idea that allows the reader to come away with more than the sum of the parts" (Kiefer 6), rather than as primarily an early literacy tool.

The literary picturebook can contribute to the aesthetic development (Doonan 7) of its players—of all ages—and may be the first piece of fine art that many will own and hold in their own hands. But even viewed as chiefly a literary artwork, the picturebook is still an immensely valuable literacy tool, while being so much more besides. For those fortunate enough to experience it, the pleasure and intimacy of shared reading, with its accompanying cosy conversations about ideas in the book, is one of the great pleasures of childhood. The irresistible call of rhythmic, musical or simply beautiful language combined with rich and intriguing artwork are enticements to learn to read. Playing picturebooks and their digital cousins affords print awareness (Diamant-Cohen and Hetrick xiii), and hearing words read is a precursor to reading fluency. Talking about story in a shared reading develops vocabulary and awareness of the structure of language and narrative (Cameron-Faulkner and Noble).

Most of the benefits and pleasures of shared reading are also available to children with reading challenges because shared reading and playing picturebooks are more than tools for word recognition, and can provide an understanding of other vital aspects of language and story structure. Shared reading of a picturebook aids development of an eye for the aesthetic pleasures of pictures, an ear for the musicality of language, and provides exposure to the sophisticated philosophical world of ideas that picturebooks can present (including truths about life and relationships) and the rest of the wide range of topics addressed by artists and writers. Humour, considered to be a useful stylistic device for engaging children in reading, is also a valuable learned personality trait, a quality that picturebooks can teach, especially irony, a sense of the absurd, and irreverence for pompous or undeserving authority. All of these elements can be available to people of all abilities, especially when story can be accessed through the multiple modes of words, pictures, narration, sound, interaction and animation.

Viewing the picturebook and picturebook app as rival formats has been the approach of a number of studies such as the Joan Ganz Cooney Center's *Print book vs. E-book* (Chiong et al.). Another instance of such dichotomization can be found in Margarete Schons' article "Is the picture book dead? The rise of the iPad as a turning point in children's literature." In her comparison of Oliver Jeffers' *The Heart and the Bottle* picturebook to the app, she frames the digital format as a rival of the picturebook, calling it "a challenge to traditional picturebooks" (124). These studies do not see the formats as potentially complementary and give only superficial attention to the picturebook app's literary and artistic qualities.

When I started researching this thesis, there was only one major paper which viewed the picturebook app through the lens of picturebook scholarship: "From Slate to Slate: What Does the Future Hold for the Picturebook Series?" by Ghada Al-Yaqout. In this seminal article, multimodality in the picturebook and subsequently the app is eloquently described. In her section entitled, "What does the iPad have to do with Picturebook Scholarship," she very usefully gives a précis of the scholars who have defined and discussed the picturebook as the quintessential multimodal text, including Nodelman, Nikolajeva and Scott, Sipe, Stephens, and Doonan (65-66). Summing up with her own succinct definition, she states, "the amalgamation of words and images is the most important idea associated with the study of the picturebook. It communicates two of the main ideas connected to its meaning, namely, text and image in an interdependent meaning making operation" (65-66). Since then, more scholars are moving beyond studies which compare reading comprehension in paper and digital books, and are looking at the picturebook app as a literary artwork. Ture Schwebs looks at one story app through the lenses of aesthetics and poetics.

In his article, Schwebs comments on the volume of studies which look at picturebook apps through an instrumental lens and focus on the technical affordances, children's digital usage studies, early literacy and digital reading studies, and commentary on the picturebook app in "consumer-

oriented journalism," in contrast to the paucity of consideration given to the literary and aesthetic attributes of picturebook apps (1). He goes on to demonstrate the value of using aesthetics to examine picturebook apps in his close reading of *The Fantastic Flying Books of Mr. Morris Lessmore*. Like Scwebs, Bizzocchi and Tanenbaum also believe that a poetics of emergent media (which would include picturebook apps) still needs to be developed (269).

This type of scholarly attention could mean more literary picturebook apps with high-quality art and text which measure up to the best in picturebook publishing, combined with professional editing, design, programming, animation, and studio recording of sounds. Two examples of literary story apps created by talented teams are *LittleRed App* and *The Voyages of Ulysses* (see appendix A for a list of apps reviewed for this thesis). Both apps are grounded in important literary texts, and are beautifully illustrated, professionally narrated, and enriched by original music composed for the projects.

I agree with Kate Wilson of Nosy Crow who feels that changes in the picturebook format are taking place whether we like it or not, so it's essential to ensure that the qualities we believe are important in the picturebook persist in the picturebook app (2-3). Little can be gained by pitting the two formats against each other. The increase in the number of modes characteristic of digital and web reading are, in fact, changing the way everyone reads, not just children. We are moving from the traditional linear reading style to one of moving around the screen to different points of salience: a presentation of sound, image, video, and hypertext on the same webpage where "one does not read the language and then the pictures and then listen to the sounds; rather, one takes them in as a gestalt, a whole, all at once" (Duncum, 259).

3.3 Picturebook Scholarship on How Children Read

Children's nonlinear reading style and their inclination to puzzle has implications for picturebook app creation. Picturebook scholarship tells us that children read picturebooks in a non-linear, hermeneutic way (Sipe, "How Picturebooks Work" 101). Children look at illustrations more slowly and carefully, finding details that adults fail to notice (Arizpe and Styles 192; Kiefer "Potential" 8). And fascinatingly, for children learning to read, the picturebook is a puzzle to be solved through piecing together information from the pictures and the words in order to deduce the story. Indeed, "the fact that words do not describe everything that can be seen in a picture creates a game" (Nodelman, *Words about Pictures* 215). Nodelman and Reimer propose that all picturebooks can be seen as puzzles because the reader needs to deduce what action is being suggested by the still pictures; what movements in time and space; and what ironies, implications, and connections exist between the two modes. They argue that "the pleasure of picturebooks is not just the stories they tell but also in the game of figuring out what those stories are" (298).

Mackey deepens the discussion on picturebook puzzling by redefining picturebook reading as playing the text, an activity which is both intellectual and physical. Play as strategizing and interpreting could be seen as refinements of Nodelman and Reimer's analysis of the kinds of puzzling that the picturebook requires. Discovering interactions, figuring out how they work, finding connections between interactions, and discerning the interrelationship between interactions and the other modes in a movable book or app could all be considered what Mackey calls serious play, and the process of figuring out how words and images relate as play as interpreting. Her play-as-performing "involves some kind of bodily immersion in the activity" (167), a concept applicable to the picturebook where performance may include reading aloud, navigating through the book or device, and playing with interactive mechanisms, all of which demand deduction, experimentation, and dexterity. (Mackey 167-170).

It's important to take into account the existing playful characteristic of picturebooks when evaluating and creating picturebook apps where playfulness can become more pronounced by virtue of the picturebook app's interactivity, sounds and animation.

3.3.1   App Hints

Knowing how children play picturebooks is particularly relevant to creating a picturebook app where many images, animations, and sounds need to be discovered through interaction. Developers encourage touch by placing hints on story screens to point to interactive features, from Nosy Crow's flashing blue dot on the object to tap, to animated arrows and pointing fingers, as in Loud Crow's *Charlie Brown's All Stars*, to written instructions appearing on the screen, as in the 2010 app *Jack and the Beanstalk Children's Interactive Storybook* by Ayars Animation. The first picturebook apps to be published often contained a good deal of instruction, hints, and parents' pages that outlined what to look for and how to play the app. But, as time went on there was less of this scaffolding, perhaps because conventions quickly became common knowledge, or because, as I am more inclined to think, developers learned through experience what picturebook scholars have studied extensively, that children will patiently pore over a picturebook spread. Children puzzling and making connections between modes is part of what defines picturebook reading—and, it should be noted, not even difficult postmodern picturebooks come with instructions.

Placing a lot of hints may point to an incomplete understanding by the picturebook app maker of the repetitive, exploratory, experimental, speculative, deductive, and hermeneutic way children play a picturebook. Developers without this knowledge may not have faith that children will find and figure out interactions. They worry that the interactive features they've painstakingly created and placed in the app will not be found the first time round, not realizing that codex picturebooks are played again and again, and new details and interpretations discovered with each

repetition. The app designer's need to hint might also point to a lack of logical interconnection between the narrative contributions to the story made by each of the modes of words, pictures, sound, animation and interaction on each screen.

Knowing that children look closely, carefully, and repeatedly, noticing things adults don't guided my decisions on whether to provide hints in the app. As one of the earliest apps, *The Heart and the Bottle* has formal hints on every page and is an example of how the first apps for children demonstrated the developer's belief that children needed to be pointed to all the interactions and would not be able to discover them on their own. The hints, turned on by tapping the hint button at the top left of the screen, show as grey dotted lines and arrows diagramming interactive objects and how to move them, as well as a few written instructions.

In deciding when to provide hints, I have also been guided by the notion of the pleasures of puzzling (Nodelman and Reimer 298). This led me to use as few hints as possible, wanting to encourage exploration and deduction. What hints I have placed are small movements to invite touch, such as playing the first few frames of a the longer animation I want the player to initiate (e.g., on KE12 Igor makes shovelling motions to hint that he wants to dig a hole) when reading and/or listening to the story may not provide enough clues.

In *The King's Ears*, characters sometimes ask players for help in a speech bubble, as in: the apple man's request for help to pick up his spilled apples on KE18, Igor's invitation to help cut the cat's hair on KE6, and the indirect request of the shepherd on KE15 for help in making a flute. Sometimes the hint is having a character looking directly at the player while making an urging gesture, as the king does from his picture frame on KE23 when he holds out his hands to the player as if asking for help. Frederico discusses how this works in *Lil Red*,

> . . . this app presents reader recognition and participation as metafictional devices. The boundaries between fiction and reality are broken as readers are explicitly addressed by the

characters, who dialogue with them and ask for their help to finish certain tasks; readers'

actions are critical to the development of the story. (145)

I have also tried to create an expectation that a protagonist will be interactive regardless of hints.

The fact that adults need hints and instructions, and children much less, creates a difficulty I

have not yet seen discussed with regard to both shared reading and app reviews. Adults sharing a

picturebook app with a child may assume after glancing at a screen, that they have seen everything

there is to see. If they believe that word recognition is the most important aspect of picturebook

reading, or that the words and pictures tell the story and everything else is a diversion, they may

hurry children along, impatient with interactions. The picturebook app designer needs to know that

children reread on their own and with others, and trust that children will eventually find all their

clever interactions without excessive hinting.

3.3.2   Word Highlighting

Many reviewers consider word highlighting in picturebook apps to be an essential feature.

When viewed through the lens of picturebook scholarship, it is difficult to see how the busy

animation of words lighting up one after the other, an action which *cannot be controlled by the*

reader, can work with the multimodal process of playing the picturebook. Furthermore, word

highlighting, simply by virtue of its overwhelming presence, makes the picturebook app *about* word

recognition, thereby reducing it to a workbook rather than literary artwork. While not actually

popping on and off the screen as the words do in the Dr. Seuss picturebook apps by Oceanhouse

Media, word highlighting barrels along at the speed of the narrator's voice. This makes words

effectively transient, adding needless difficulty to the challenge of learning to read. Because of the

prevailing instrumental view of picturebook apps, the practice has become quite widespread. Many

developers, such as Nosy Crow, have added word highlighting in updates to existing apps. My belief

is that it introduces unnecessary busyness to the screen and interferes with a personalized pace of hermeneutic cycling through the modes of the story.

3.4   Modes Should Be Child-Controlled and Repeatable

Picturebook scholarship affirms that children read by cycling through modes, constantly revising what they know in light of what they learn, and that this involves not just hermeneutic cycling on a single page, but paging backwards and forwards in the book. The amount of puzzling, repeating, and replaying will be unique to each child. This process should be entirely within the child's control, and guided solely by each individual's needs, desires, and curiosity. Seen in this light, the common app feature of autoplay or "read to me" also makes little sense.

3.4.1   Repeatable Child-Controlled Animation vs. Embedded Video

Animation has always been implicit in the picturebook and, as I summarized in section 2.6, picturebook scholarship has looked extensively at how movement in time and space has been expressed in the still image. Apps allow for actual animation, but in order to interrelate with words, pictures and other modes on one screen at a time, it needs to be short, child-controlled, and replayable. As Jon Klassen remarks, "one of the big differences between books and animation or film in general is that with books . . . the viewer is moving at their own speed through the story, whereas with film you are controlling their time" (qted. in Arrant 6).

Animations that are draggable, reversible, and tappable are usually made from sprites, numbered transparent .png files, which are played sequentially when triggered by a touch. Sprite animation allows for playing with individual characters and objects important to the story, rather than watching an animated movie play inside a non-interactive rectangle. A number of producers of animated films, such as Disney, have repurposed their TV and movie assets as picturebook apps, but

the picturebook app derived from an animated film is an uneasy hybrid. Text is created after the fact, and word highlighting and narration added. As technically accomplished and beautiful as the parent films are, the animation in the picturebook apps that spring from them is not interrelated with the other modes. The active engagement of the reader is limited to a few areas, while most of the child's experience with the story is one of watching rather than playing themselves. For this reason, I don't think embedded video such as the movie clips in Disney's *Planes* app, or the ones from the TV show in the *Stella and Sam* apps, has any place in a quality picturebook app.

An example of excellent interactive, replayable animations can be seen in Nosy Crow's *Rounds: Franklin Frog* (Tranter). Interactions help the player understand how a frog's legs move as Franklin is tapped and dragged to jump and swim. Helping Franklin catch animated flies teaches how his tongue works. All the charmingly stylized, but biologically accurate, animations allow children to inhabit Franklin's body as he develops from a little black tadpole into a grownup green frog, making the life cycle of a frog into a story full of excitement and insight.

3.5   Conclusion

In this chapter, I've described the main principles derived from picturebook scholarship which have guided the creation of my picturebook app. These concepts have helped me to keep the multimodal reading experience that allows children the autonomy to play at their own rate and in their own way at the forefront of the juggling act that is picturebook app design. From this iterative work, a framework has emerged, grounded in six questions that designers can use to guide the development and assessment of picturebook apps:

1. Are the assets to a professional standard? As with a good picturebook, a good picturebook app must be made of great materials, which are well edited and designed. Too often the words, pictures, and sounds in the picturebook apps in the App Store are amateurish and the editing

nonexistent. However, the number of collaborative and arts-driven picturebook apps is increasing, challenging the ones made by amateurs, game developers who assume game aesthetics and mechanics can be simply transferred to children's picturebook apps, or media corporations seeking to repurpose their movie assets. Some examples of excellent, professional, artist-driven picturebook apps are *Metamorphabet* by painter-programmer Patrick Smith, *Nighty Night* and *Little Fox Music Box* by Heidi Wittlinger, *The Voyages of Ulysses* by Elastico, *LittleRed App* by Paloma Valdivia, *Petting Zoo* by Christoph Niemann, and *Rules of Summer* by Shaun Tan.

2. Are the sounds, interactions, and animations helping to tell the story through enhancement, alternation, and/or contradiction?

3. Do the words remain on the screen to allow for print awareness (Diamant-Cohen xiii-xiv) for children who cannot yet read or, for those who can, to allow hermeneutic cycling? Or, is text being moved on and off the screen or being automatically animated with word highlighting?

4. Is there judicious use of hinting which leaves room for serious play and puzzling? Is there a logical connection between an interaction and the story that rewards puzzling?

5. Is the interaction integral or incidental? If the latter, is it just too darn cute to resist, or is it just something to add busyness to the screen? On KE21, Igor cries so much his tears start to fill the room. Trevor, one of the app's programmers, begged for the bird to travel through the pool of tears in a submarine, so I made an animated medieval submarine pedalo (see fig. 8) out of gourd and a medieval garden cloche for Trevor to program. I stipulated that the only children who would get to see the bird were ones with the patience to wait and see how high the sea of tears would rise. It's ornamental but very cute.

Figure 8. Submarine pedalo from screen 21 of *The King's Ears*

6. Are animations automatic or child-controlled and repeatable? Sometimes I was so charmed by my own animations that I forgot that the most important thing is not how sweet it is but if the child can start and replay it. If not, is there a way to redesign to make it so? The connection between the hand and the brain may make an animation triggered by the finger, such as dragging a flying bird around the screen feel more real and exciting, and encourage embodied empathy.

I propose that these six questions, emerging both from my review of existing literature and my unique design-based inquiry could be considered as a kind of guiding framework for the design of picturebook apps. Such a framework may also be useful for scholars, librarians, educators and parents seeking guidance in the evaluation of existing picturebook apps. In the next chapter, I will further unpack how these guidelines interact with the technical implementation of designing a picturebook app.

Chapter 4: Adapting *The King Has Goat Ears* to a Picturebook App

4.1   About the Codex

The King's Ears is an adaptation of the print book, *The King Has Goat Ears* written by

Katarina Jovanovic and illustrated by Phillipe Béhà. It was given a four-star rating in *CM*: *Canadian*

Materials (Sept. 12, 2008), won the Christie Harris Illustrated Children's Literature Award 2009

(BC Book Prizes), and was finalist for both the Chocolate Lily Award 2010, and the Blue Spruce

Award (Ontario Readers' Choice) 2010. It has been translated into Korean, Chinese, and French.

The story is based on a folktale that dates back to ancient Greece and the story of King

Midas. It has been retold for a modern audience by early childhood specialist Katarina

Jovanovic, a Serbo-Canadian poet and former journalist who worked for many years in children's

programming for Serbian radio.

The lively mixed-media and collage illustrations were created by Philippe Béhà, a Québecois

children's book illustrator. This prolific artist has illustrated more than 170 children's books,

including ten that he also wrote. His recognitions include two Governor General's Awards, the Mr.

Christie's Book Award, the Québec-Wallonie Bruxelles prize 2005, and the Marcel-Couture prize

2012. Béhà's *I've Lost My Cat* was the 2012 TD (in association with the Canadian Children's Book

Centre) Grade One Book Giveaway.[11] Béhà was also selected for the 2014 Hans Christian Andersen

Award longlist.

In Jovanovic's retelling, which stresses the importance of self-acceptance, a king hides in his

palace to keep his goat ears hidden from the people of his kingdom. Each barber who cuts the king's

hair ends up being kept prisoner in the palace so the secret won't be spread. When the boy Igor, a

trainee barber, volunteers to cut the king's hair in place of his cowering apprentice master, he learns

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[11] The TD book giveaway program is the largest free-book distribution program to school-aged children in Canada.

the king's secret. Unlike the barbers who came before him, Igor tells the king he looks very handsome and so is allowed to go home again. But, eventually, the pressure of keeping the king's secret becomes too much, so he shouts it into a hole in the ground and buries it. Later, unbeknownst to the boy, reeds grow out of the spot. These reeds are carved into flutes by passing shepherds, who discover that the flutes sing out "The king has goat ears!" instead of musical notes. The shepherds make more flutes to sell at the upcoming village fair. The king arrives at the fair just as children are blowing the flutes and releasing his secret. When a guard seizes a child, the injustice forces the king to admit to having goat ears. He learns that he is accepted and that he likes himself just the way he is.

4.2   Ongoing Research Was Part of the Process

After I saw the trailer for *The Heart and the Bottle* in 2011, I bought an iPad and reviewed many apps over the following years. I made lists of the kinds of interactions, noting whether they were used literally or metaphorically. The apps that have most influenced the design of *The King's Ears* are *The Heart in the Bottle* (Jeffers), and Nosy Crow's *Cinderella*, *Three Little Pigs*, and the *Bizzy Bear* series. Also influential were the Toca Boca apps *Robot Lab*, *Hair Salon*, *Train*, and *Kitchen*. I also returned frequently to Elastico's *The Voyages of Ulysses*, and Paloma Valdivia's *Es Asì* and *LittleRed App*, and was excited by how tapping in time to the jazzy theme music was necessary for playing *Sneak Beat Bandit*. There is a wide range in the amount of interaction and animation in picturebook apps, but *Es Así* and *Bizzy Bear* are proof that you don't need to be technically fancy to be charming and integrally multimodal—art doesn't need to be complicated to be good.

Throughout the app creation, I continued to review the scholarly literature. I also needed to understand technical issues related to building for the iPad, even if I wasn't programming it myself.

This entailed a piecemeal and ongoing research process of reading software manuals, technical blogs and websites, downloading app-authoring software, attending twitter chats and webinars, and watching tutorials—both free and subscription (such as those on the software education site Lynda.com, now free with a public library card). Because of the newness of the format and its constantly evolving nature, anyone who is not a professional video game developer goes through the same scrounging search for useful and intelligible information, much of which is shared through social media.

My initial guide for how to adapt a picturebook to the iPad was a slideshare created by Rian Visser and Klaas Verplancke, which explains how they, and the rest of their team of animator, programmer, and voice actors, made *Timo and the Magic Book App* from their published print picturebook. The slideshare demonstrates how assets are made by opening the digital files of the codex illustrations in Photoshop. All objects (such as story characters) that will be animated in the app must be cut out of the background, and the resulting holes in the background need to be patched. The art also has to be reformatted and recomposed to fit into the iPad's dimensions of 2048 by 1536 pixels.

4.2.1 Technical Research

Apps are software and need to be programmed or created in a no-coding software. I explored six app-authoring software programs which had tools to add sound, animation and interaction before deciding on Robot Storybuilder, which has an easy, attractive interface, a wide range of interactive functions, and works reliably even though it is still in the beta stage of development. It has a really nice partner app called Robook for sharing your builds with others without having to go through Apple.

At the same time, I took computer-programming courses with the Khan Academy and Lynda.com, even though I strongly suspected that I was no Patrick Smith. The first eleven screens of the app were built with Robot Storybuilder. I eventually became a little frustrated with the limitations of the software and being unable to customize their built-in mechanics. So, with the help of a loan,[12] I was able to hire two programmers to code the app in cocos2d, an open-source app engine.

Collaborating with programmers meant learning new vocabulary and concepts to do with programming, asset delivery, and making app builds. We had to agree on sharing systems, workflow, reporting, and review processes. I decided I wanted to allow everyone who worked on the project to have creative input, a decision I sometimes regretted because it meant having to constantly defend my decisions. But, arguing did force me to whittle down the guiding principles outlined in chapter 3 to a few succinct phrases. Most of the time, however, I was very happy to hear the often wonderfully creative suggestions of the graphic designer and two programmers on how to improve my design.

4.2.2 Aesthetics vs. File Size

The publisher's high-resolution scans of the illustrations for *The King Has Goat Ears* beautifully reproduce the textures and colours of the traditional media, but the file sizes of the 300 ppi, 12 x 10-inch (single-page illustrations) and 24 x 10-inch (double spread) are very large indeed. Even after reducing them to the iPad's high-definition size of 72 ppi x 2048 x 1536 pixels, these detail- and colour-rich files were bigger than the digital images typically used in games and educational apps. *The King's Ears'* art, and the sprites made from it, presented challenges for the programmers in the area of memory management and how it affects creating a smooth-running picturebook app. The programmers were anxious about an app of 500-600 MB and suggested

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[12] I received funding from the Canada Media Fund under their Experimental Stream.

replacing painterly backgrounds with blank screens and reducing the resolution of the foreground elements, but I love Béhà's art and wasn't about to sacrifice it. After researching the latest information on picturebook app size, I reassured them that with retinal display's nearly print-size resolution, Apple was forced to raise its maximum app size to four GB, and picturebook apps had become very large. Interestingly, the data on the average size of picturebook apps only resides in the brain of Carisa Kluver, editor of Digital-storytime.com, a comprehensive story-app review site. In an email correspondence, she told me that picturebook apps are now typically 500 MB and, if animation-rich, can be up to one GB.

Apps can continue to be fixed after publication, which is very different from print publishing where a picturebook passes under many sets of eyes as it travels through the stages of approval and correction until it is as perfect as humanly possible before going to print. But apps are often flawed when published because fixes by the developer are ongoing.

4.3   Adaptation

The process of adaptation required repeated close reading of the codex, giving me an ever-growing appreciation of the meaning embedded in Béhà's illustrations. I returned to them again and again to discover his implied animations, interactions, and sounds, and used them as a roadmap for the app. Creating animations meant that I had to produce new art in the illustrator's style to show the action leading up to and following the *instant quelconque,* or slice of time, chosen by the illustrator to represent an entire event. With the app, I got the chance to expand events and add longer sequences than the 32 pages of a picturebook allows. Yet, doing this brought home to me the compression of meaning found in a great picturebooks and the amount of thought the reader must put into observing and deducing in order to fill in the implied sequence of events and other dimensions of meaning. I realized that in expanding a double-page spread to several screens,

something is lost. The cognition required to circle from text to picture and back again which happens when a child reads a picturebook may be less rigorous and deep when there are more images. I reminded myself that the addition of nonredundant sounds and interaction in the app, when done well, can increase the dimensionality of the story beyond the interaction of the two modes usually found in the picturebook.

4.3.1   Moving from Paper to Screen

My design falls neatly into Mackey's reconception of adaptation as "re-play" (175). Re-play is a less faithful reproduction, allowing changes in the book's text in order to create more playful elements, which is what I believe I've done by creating new "pages" (screens) and illustrations, as well as editing the book's text to reduce redundancies between modes and create more alternation of story content between the modes. To open up the compressed picturebook story to make room for more modes, and, hopefully, increase opportunities for interaction and discussion, I expanded the codex's 17 story illustrations (13 spreads and four single-page) to 22 app screens. Additions include:

- KE3: in this new illustration, the picture frame from KE2 becomes a mirror to show the prison of self-image from the king's point of view.

- KE4: a new background in Béhà's style shows the worried king in relation to the people.

- KE6, KE7 and KE8: the book's one opening (opening 3), which introduces Igor the apprentice and Miro the barber, has been extended to three screens in the app and includes the cat-haircut activity (KE7).

- KE9 and KE10: On opening four in the book, the king's haircut is shown as a *fait accompli.* Strangely, after the evidence on the previous opening of Igor's terrible haircutting ability, the king in the book is perfectly groomed. I made a new illustration giving the king a haircut like the cat's. The app has two screens to show the king's hair before, during, and after the haircut.

- KE16: a flute-making activity has been added. (Please see appendix B for images of the above screens.)

I tried with these added screens, along with the new storytelling modes, to delve deeper into the characters and themes, and to encourage a playful, rather than judgmental, attitude to human folly. Referencing the work of Judith Mayne, Mackey suggests that adaptations of books to other media can not only be judged in terms of how closely they follow the book; or how well they stand as independent works of art, but also as "commentar[ies] on the narrative process itself" (as qtd. in Mackey 175).

4.3.2   White Screen vs. White Paper

Béhà, like many picturebook illustrators, often uses the paper itself as a background, letting the art float in a sea of white. And, like many European illustrators, he used the white of the paper for skin colour. I realized during the adaptation process that in the codex, an absence of marks on the paper doesn't mean there's nothing there—paper is also physically present with smell, feel, weight and texture. But, leaving the iPad screen blank results in a glaring white absence, so I adapted or created background textures and colours to go with the illustrator's completed foregrounds. Unfortunately, it wasn't until much later that I realized that I'd left all the characters paper-white.

4.3.3   Finding Sounds

The final work is a rich, layered, highly interactive picturebook app narrated by Monty Python's Terry Jones, with theme music by Skip Peck, a prolific composer for television and film. I purchased the music and some sound effects, commissioned studio recordings for the king's nonverbal utterances, sheep, flute notes, and flute singing voice, and attended a London recording session via

skype with Terry Jones. Downloading sounds from the interesting freesound.org meant learning to edit them in the Adobe pro sound software, Audition.

Programmer Judy Ng and I have both studied music, and brought our understanding of tempo and harmony to the musical interactions, especially in the flute interactions. Because the activity is enabled for chords, the flute notes and the child's voice singing "the king has goat ears" had to be in perfect pitch and in a key compatible with the theme music. In their relationship with the other modes, the sounds in the app are mostly enhancing, but occasionally act in counterpoint as when the cat purrs during the haircut game, thereby deepening meaning. Rich sound makes the story and characters believable and gives the story world its own reality, particularly noticeable in the meadow scenes, and those with horses and the king's voice. Terry Jones' superb acting and professional recording of the narration add immeasurably to the app experience.

4.3.4   Avoiding Text Transience and Redundancy

In terms of the early literacy value of the picturebook as a literary artwork, I embrace Diamant-Cohen's strategy of print awareness, and the importance of seeing the printed word on the page as an important stage prior to learning to decode it. Children who can recognize some words and sound out others will be very much involved in the hermeneutic cycling described by Arizpe and Styles: ". . . the eyes . . . move back and forth between the words and the images, leaning on each other for understanding, confirming or denying hypotheses about what is happening in the story" (201). Knowing this aspect of how children read has guided me in the placement of text in the app and made me discard any ideas of kinetic text, or moving it on and off the screen to make room for interaction. According to Stichnothe:

Transient texts present a particular challenge to the reader who is unable to control the pace in which the scriptons appear and disappear and can only hope to keep up with the

programmed speed. Book apps for pre- and grade school children are usually designed to

encourage beginning readers and a transient text would be clearly detrimental to this purpose

. . . [and] must be regarded as a serious drawback. (2)

Not having the picturebook's facing pages in the app means less space to arrange text and

pictures. Hermeneutic cycling in the picturebook codex happens because words and pictures are

together on the same opening. Failing to keep words and pictures together on the same screen in the

picturebook app or to make the text transient prevents the kind of word-picture cycling and puzzling

which makes the picturebook such a unique and apt format for children. For that reason, I felt that

Christopher Haughton's app *Hat Monkey*, which placed words and pictures on consecutive screens

was not as successful as it could have been. Similarly, Loud Crow's *Charlie Brown's Christmas*

places the app's large amount of text in several panels per screen so a line of text has to be swiped

away to show the following one. Nosy Crow has also been criticized by reading specialists for the

transience of the speech balloons, which carry the narrative in their apps. (They are keeping the

speech balloons on the screen longer now.)

I felt that words in *The King's Ears* should be visible for as long as the player remained on

the screen. It meant sometimes paring down the original text, keeping those thoughts that could only

be expressed in words, and editing out words that could be expressed in other modes, thereby giving

more narrative responsibility to animation, interaction, and sound. For instance, the 27 words of the

following excerpt:

On the day of the May Fair, the villagers were surprised to see the king's carriage driving

slowly through the fairgrounds. Dark curtains hung over its window. As the carriage came to

a stop, a tiny voice sang out: "The king has goat ears! The king has goat ears!" (Jovanovic

and Béhà)

became in the app: "On the day of the fair, the villagers were surprised to see the king's carriage."

The last sentence, without the repetition of "The king has goat ears," was moved to the next screen. The words "dark curtains" were taken out of the text because they are represented in the picture, and are emphasized in the app with animation and sound (the king is so fearful that the curtains shake, and tapping them makes him peek out and yelp.) "Driving slowly" became part of the interactive animation of dragging the horses and carriage onto the screen.

The illustration for this tenth opening is also interesting because it shows Béhà's use of the comic book's motion lines, which for me acted as directions on what to animate. The lines around the apple man and his apples suggested that there should be an animation of him being bumped by the carriage, which sends his apples flying, and an interaction of picking them up. Another screen where text was greatly reduced and the narrative weight transferred to other modes is KE21 where Igor begs the king's forgiveness.

The 101 words of the book are as follows:

When the king returned to the palace, young Igor was waiting for him. The boy told the story about shouting his secret into the hole, the reeds and the flute.

Everything that happened at the May Fair was my fault, Your Majesty," he cried, throwing himself before the king. "I beg your forgiveness."

"There is nothing for me to forgive. Instead I will reward you, young barber," said the king, "for you helped me to start liking myself the way I am! Would you like jewels, gold or money?"

"I already have my reward being Your Majesty's personal barber," answered Igor.

In the app, the passage become the following 40 words:

When the king returned to the palace, Igor told him about burying the secret, the reeds and flutes.

"Everything that happened at the fair was my fault." Igor cried. "Please forgive me!"

"There is nothing to forgive," said the king.

The passage about the king's gratitude became an interactive speech balloon with the words, "Thank you." I thought Igor's happiness about being the king's barber was evident throughout the app and the fact that the king now liked and accepted himself was stated on the last page.

4.3.5   Replacing Text with Sound

Sounds implied by the font, layout, and action lines of the picturebook illustration are actualized in the app. A good example of this is on opening six of the codex (see fig. 9) where Igor shouts his secret into a hole in the meadow.

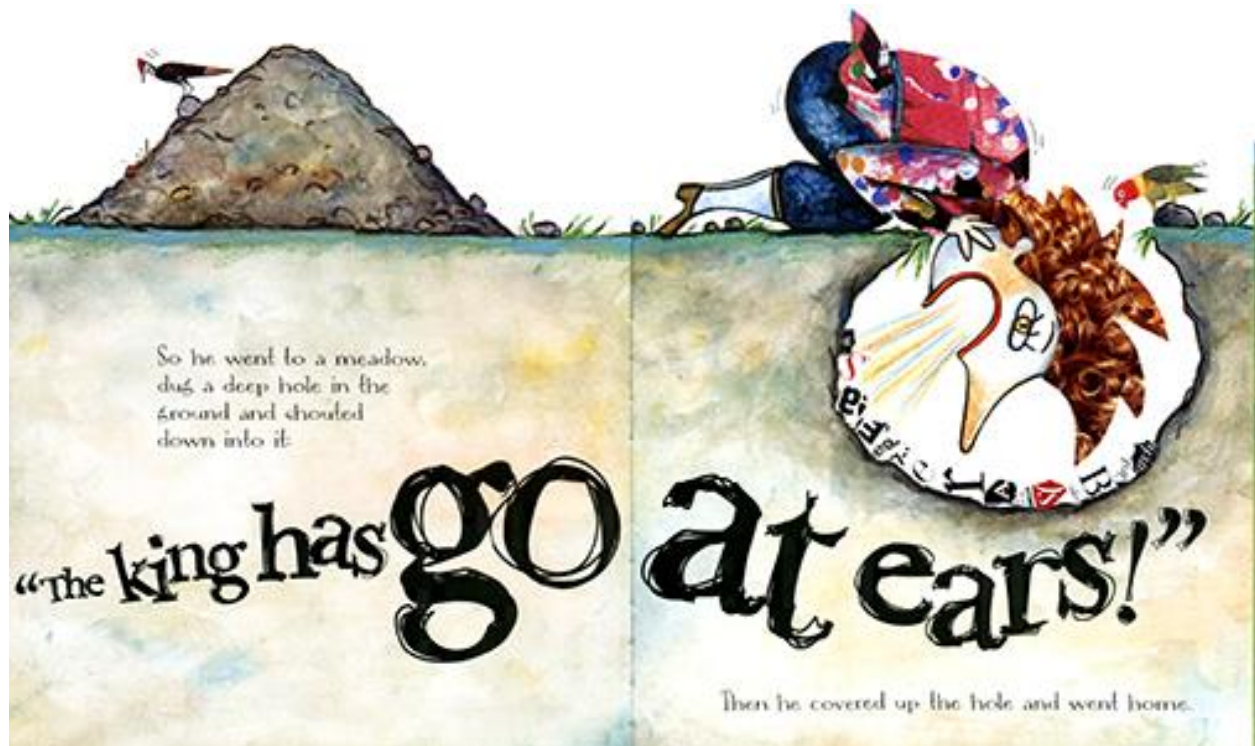

Figure 9. Opening six of *The King Has Goat Ears*.

In the app, the words "The king has goat ears" no longer needed to be large and laid out on a wavy line as they are in the codex, since they can be heard in the well-acted narration. Béhà's

motion lines became an animation of letters pouring out of Igor's mouth, and the letters became draggable to spell out the phrase after they exploded onto the screen.

4.4 Designing for Children

I learned a lot about about designing apps from the work of Warren Buckleitner. At his talk at the *App Camp 2013* conference ("Child Development 101") he said that:

- app operation should be intuitive.

- apps should not be front-loaded with instructions.

- apps should have intuitive navigational icons, discreet interaction hints, and be highly responsive.

- children should be in control and always able to get out of what they get into, namely, being able to page forward and backward, stop, and return to the beginning.

- apps should be suited to the developmental stage of the reader. (*The King's Ears* is targeted at grades two to three, but it can be enjoyed by ages five and up.)

- apps should not exploit children, namely, no advertising, no in-app purchasing, no live links which take the child out of the app and onto the web, no spyware for monitoring player activity to use for marketing, app development, or parent reports.

- apps must be well built and not crash.

4.4.1 UI and Navigation

User Interface, or UI, is a form of interaction in the picturebook app and must be learned in the same way that small children have to learn how to handle books. Children learn that a book progresses from the left (or right, depending on their culture), and what differentiates the paratext from the story proper or whether these sections overlap.

In the picturebook, paratextual elements need to cohere aesthetically and thematically with the rest of the book. Sometimes the story itself extends into paratextual elements, such as in the endpapers or title page. Components are often lifted from the illustrations and placed on the book spine, title and copyright pages, and cover flaps. In the picturebook app, there are no endpapers but there are cover and information screens, which may include copyright information. In addition, there is a loading screen, icons for activating narration and screen changes, and an interactive menu. Another paratextual element is the app icon, which appears on the iPad's home screen when the app is downloaded. All of these elements and the way they behave need to be negotiated by the player.

In designing the UI of *The King's Ears,* I kept Buckleitner's points in mind while examining how navigation was designed in a large number of apps. But after a long process of research and designing, I still felt what I'd done wasn't up to a professional standard, so I hired graphic designer Elisa Gutièrrez, who was the original designer of the *The King Has Goat Ears*. She is a very experienced children's book designer as well as being a talented picturebook maker. She observed that much of the action in *The King's Ears* was taking place at the bottom of the screens and suggested moving the screen-turn icons to the top. She also said that although the icons I'd made were very nice, they looked like part of the art instead of being part of the UI. She redesigned my text layout and font and navigation icons.[13] The first of the following two illustrations shows my icons, layout, and menu (see fig. 10), and the second shows Elisa's redesign (see fig. 11). Notice how Elisa separates the UI from the story with her clean monochrome design.

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[13] Elisa also helped to prepare assets and made a few of the simpler animations. She created the pig hairstyles and accessories on KE22, and for the flute activity screen, she designed tune icons that look like little scraps of musical notation.

Figure 10. Cynthia's navigation icons and menu for *The King's Ears*.

Figure 11. Navigation icons and menu created by graphic designer Elisa Gutiérrez.

Chapter 5: Discussion and Future Work

5.1   Conclusion

This thesis has looked at how established scholarship on the nature of the picturebook and how it is read can be used to both create and assess the new format of the picturebook app. Sipe's view that both words and pictures are modes, and that the picturebook is a multimodal text ("The Art of the Picturebook" 248) has been particularly helpful in establishing a frame that can be usefully expanded to include the app's additional modes of interaction, sound, and animation.

Picturebook scholarship on the ways that words and pictures combine to form a whole through enhancement, alternation, and contradiction acts as a set of instructions for the maker of the picturebook app wishing to ensure the format's additional modes are integral. Schwarcz (4) and Nodelman (*Words about Pictures* 221) say that, in the best picturebooks, words and pictures each add something new and essential to the narrative and are not redundant, unlike the illustrated book where words and pictures often say the same thing.

Picturebook scholars have also taken a very close look at how children read the picturebook, showing that it involves puzzling, close examination, and hermeneutic cycling which has implications for the amount of hinting and instructions that need to be in the picturebook app.

Picturebook scholarship has also looked at the way sound and animation, in the form of movement through time and space, are present in the picturebook through implication in the illustrations, design, and the musicality of the words (whether spoken or in the mind's ear).

In chapter two, I looked at how interaction already exists to a high degree in the movable picturebook. While an in-depth exploration of the devices of the movable book is beyond the scope of this thesis, I noted that the interactive devices of the paper book have been adapted and translated to the touchscreen format, making a direct line of evolution from the codex to the picturebook app.

In the recent past, the interactivity of the movable book, often called a novelty book, was felt to disqualify it as literature. But quality picturebook apps, quality toy apps, and educational digital games, along with a resurgence in interactive codices have emerged in the marketplace concurrently with a reëvalutaton of play in learning and literature.

I've looked at how commentators on the picturebook app have often fallen into either-or arguments, positioning the picturebook app and picturebook in opposition to each other, rather than alongside. Studies on which format produced higher comprehension scores or the most peaceful adult-child shared reading experience abound. Sounds, animations, and interactions have been called distractions and diversions that interrupt linear reading, even though picturebook scholars agree that picturebook reading is not linear. Some critics have suggested that the amount of interactivity present in a picturebook app is the way to gauge the quality of a picturebook app, as if play and reading are mutually exclusive, and that too much play "reduces" a book to a toy.

Margaret Mackey feels that *play* should replace *read* in discussing the picturebook (166) and that the hand is a pathway to the brain (113). In my design of *The King's Ears*, I believe I've shown that interaction, animation, and sound can indeed be integral to the narrative in the picturebook app. But for those who still find it hard to decide whether an app is a toy or a picturebook, I suggest that the answer can be arrived at by asking the question: "Who is telling the story, the child or the author?" Toys provide children with imaginative prompts to *tell themselves* stories. The digital interactive environments of the apps of Toca Boca and their Canadian company, Sago Sago, are open-ended and nondirective (Logan 4:50). Their apps, inspired by great toys and games, which have persisted in different forms for centuries (Jeffery 5:30), provide jumping-off points for child-led imaginative and often narrative play. These digital toys must be as unstructured and bendable as possible. But a picturebook app, like all stories, does have a structure and we have seen that

interactions can be used in the service of the story to lead the player on a journey of author's devising.

It is human nature to love stories, to follow a character on a journey, to identify with the protagonist and hate the villain. Great literature stretches our capacities to empathize with flawed protagonists and a humanized villain. Literature seeks truth but always indirectly, since truth is often only visible out of the corner of the eye. We have stories we want to share with children for a number of reasons and agendas—to entice them to love and eventually master language is one of them—but we also use stories to teach values and forewarn of dangers ahead. For all children, but particularly those with reading challenges, movable books and picturebook apps provide an entry into the world of structured stories and literary language.

5.2   What's Next?

The next step for me is to submit *The King's Ears* to Apple's App Store followed by a marketing campaign that will include making a website and a trailer. I will continue to send proposals to conferences on how picturebook scholarship can guide quality picturebook app creation and informed criticism of the format. My next paper on animated hybrid forms related to the picturebook will be given at *The Cosmos of Animation* conference in Singapore in June 2016. At the end of 2016, I will submit *The King's Ears* for consideration to the BolognaRagazzi Digital Award.

The aspect of picturebook apps I would next like to explore as a creator is the simultaneous design and publication of a picturebook and companion picturebook app using my own story or one by another Canadian picturebook maker. Working on a picturebook and app concurrently will have implications for both the art production and graphic design.

5.3   Suggestions for Future Research

This thesis examines the creation and assessment of the picturebook app as literary artwork. For the picturebook or story app to be valued by the larger community concerned with children's books and literacy, I feel it's important to demonstrate the format's potential as a category of literary artworks for children, and to show its ability to encompass the high-level qualities we associate with the best picturebooks. Studies are needed which go beyond comprehension comparisons between codices and apps, to include observations and recording of children's engagement, strategizing, and discussions while playing apps in small groups or other shared reading situations. These should include children's responses to integral sounds, animations, and interactions. An important subcategory of such studies would be to look with particular attention at children who have not previously done well with reading codex picturebooks to see if apps are helpful in bringing them to literature.

Secondly, more close readings of picturebook apps by picturebook specialists who are open to examining the multimodal potential of sounds, interactions and animation to carry narrative weigh, such as Ture Schwebs' reading of *Morris Lessmore*, will help to raise the bar of what constitutes excellence in a marketplace flooded with mediocre story apps.

The following is a short list of suggested directions for future studies:

1. Recording the hands and voices of children in small groups playing picturebook apps in a classroom setting would be enlightening. Noisy, busy classroom settings would allow researchers to inconspicuously hold up an iPhone to film over the shoulders of the children to record their hands and voices without intimidating them or revealing their identities. Observing and recording children in groups of two or three playing, talking, and negotiating might be a way to gain insight into how they play picturebook apps, what kind of UI works best with different age groups, and whether children engage in serious play and other problem-solving activities.

2. To what extent are picturebook apps being used in schools? My own casual observance of the iPad sets available in Vancouver schools has led me to believe that they aren't being used at all. Studies on the use of picturebook apps in the classroom are needed to learn about their potential for engaging kinesthetic learners and children with reading challenges.

3. An interesting project would be a collaboration of picturebook researchers with a picturebook app developer during iterative testing with children while an app is in production.

5.4   Learning the Hard Way

When a developer wishes to publish in the Apple App Store, the app must be submitted for curation. After release, conscientious developers will ensure their apps are regularly updated, not only to correct bugs, but to ensure that the app is compatible with Apple's frequent new devices, operating systems, and enhancements. One of the most troublesome of these for me was Apple's mandatory doubling of the resolution size of picturebook app art in order to showcase the high-resolution display features of their new devices. When that happened, I had to completely redo the art and animations of the first third of the app because you can't double the size of an image without causing it to pixelate. It is a worrisome situation that Apple is both the creator of the devices that apps are played on and the publisher, the result being that utter control of all aspects—technical, aesthetic, philosophical—of the app are under the watchful eye of one corporation. The alternative to creating apps for Apple devices (iOS) is to create Android apps for the Google Play store. Being pushed by the incessant updates and new devices brought out by corporations fighting for market supremacy is not compatible with the budget and workflow of small creative concerns. The picturebook app is hard enough to produce as it is.

To my shame, I only belatedly noticed that the art in *The King Has Goat Ears* does not reflect the multicultural reality of the beloved children of this country. I wish I had had the

forethought and boldness to change Igor's skin to brown in the beginning before all the hundreds of animation sprites were done.

Making the app required that I learn from the bottom up in a field with no clear roadmap. I discovered that I'd taken on more than one person can sanely be expected to do: designing, illustrating, animating, editing and rewriting words; buying sounds, editing sounds, booking recording studios, hiring and directing musicians and voice artists; writing interaction, animation and sound specifications in a format acceptable to computer programmers; producing and exporting image and animation assets; understanding Apple's technical requirements; hiring, firing, and project management; learning several software programs, bookkeeping, and registering as an Apple developer.

During the development and production of the app, I constantly asked myself and the people I collaborated with whether an interaction, sound or animation was ornamental or integral. It was very useful in the sometimes heated discussions I had with the two programmers, Judy Ng and Trevor Robinson. Because I was trying not to be a complete dragon, I encouraged their input, but neither have a background in children's materials: Judy comes from banking and Trevor makes shooter games. Both frequently argued for more busyness in the screens they were programming. Asking whether the animation or mechanic they were suggesting was integral or ornamental was a very helpful way to clarify my design goals and why I may or may not accept what they were proposing.

In other words, everything was really hard. The workflow, by necessity, evolved. Trial and error was stressful and required doing many things (sometimes very big things) over again. For instance, I started working with programmers before I'd completed designing the app, making the art for the screens, finding all the sounds, and making animations, and it was very, very stressful for me to produce assets fast enough to keep two programmers busy. Next time I'll complete all assets

before hiring programmers. On top of that, Apple kept changing the rules. But through trial and error, a working process, systems, and our own conventions have formed. Lead programmer Judy Ng, went through her own steep learning curve with mastering the programming language Objective C, the community-run game engine, cocos2d, and writing pages of math (see fig. 12) to create the ambitions interactions I'd asked for.
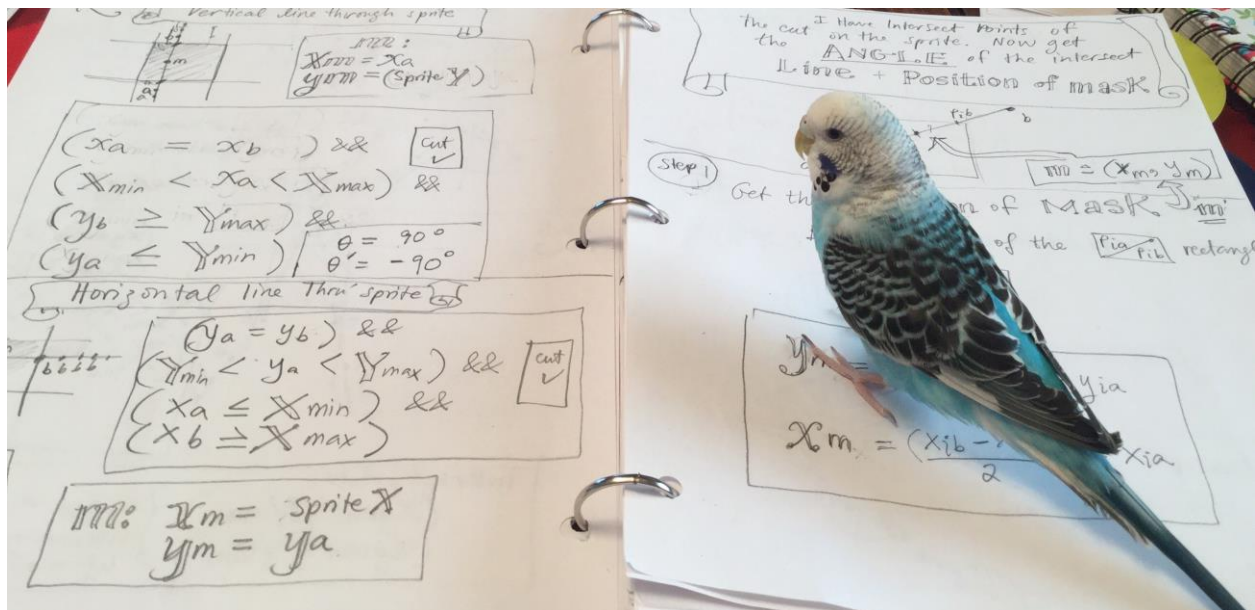
Figure 12. Programmer Judy Ng's bird, Sherlock, checks her math

Having the guidelines from picturebook scholarship along with the general principles of the children's digital space that I'd learned from Warren Buckleitner's work helped me keep my goals in focus through the artistic, technical, interpersonal, and financial aspects of app creation. Though labour intensive, I found working with sounds, animations and interaction joyous. Judy Ng and I have decided that we've learned so much, we have to work on another app together. Elisa wants to come back and so does Trevor. Next time should be easier.

5.5   My Thesis Experience

Studying in the Master of Arts in Children's Literature program at UBC has been a life-changing experience for me. When I applied, I was worn out with making children's books. It had

become just a job and I had ceased to see it as art-making. Sad and frustrated, I saw a therapist who specialized in treating artists and she advised me to go back to school. After much thought, I chose to follow the example of my friend and colleague Kathie Shoemaker, and applied to do a master's degree in children's literature at UBC. Being accepted was the beginning of seeing children's books afresh, rediscovering my love for them, and discovering an astonishing and vibrant world of creation and innovation in contemporary children's publishing—and I'm just referring to books here. I discovered the fun and stimulation of travelling to conferences, and stumbled onto the emerging form of picturebook apps which fit with my long-time interest in interactivity and narrative art-making for children.

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Appendices

Appendix A: Children's Apps Reviewed

The following is a list of children's apps reviewed for this thesis. All apps are for Apple iOS devices and were purchased from the Apple App Store. The list is organized alphabetically by the name of the author, when known; otherwise, the title is used.

Ahoiii Entertainment UG. *Fiete Farm*. Ahoiii Entertainment UG, 2014.

Anderson, H.C. *The Little Mermaid*. Auryn Inc., 2014.

---. *The Tallow Candle*. Timbuktu Labs Inc., 2014.

Austen, Mike. *A Present for Milo*. Ruckus Media, 2010.

Baldassarre, Ivano and Andrea Glioti. *The Comet HD*. Trans. Emma Bianchi. bitLuna, 2012.

Base, Graeme, *The Waterhole*. HarperCollins, 2012.

Baum, Frank. *Ozbook*. Slypo, 2010.

Beat Sneak Bandit. Simogo, 2012.

Blocmen, B., & Main, B. (2012). *Lil' Red*. (Version 1.03). Brian Main.

Boynton, Sandra. *Blue Hat, Green Hat.* Loud Crow Interactive, 2011.

---. *But Not the Hippopotamus*. Loud Crow Interactive, 2013.

---. *The Going to Bed Book*. Loud Crow Interactive, 2011.

---. *Moo, Baa, La La La!* Loud Crow Interactive, 2011.

Brooke, L. Leslie. *Three Pigs and the Secrets of a Popup book*. Game Collage, 2010.

---. *Three Little Pigs. The Story.* Touchanka, 2013.

Bruna, Dick. *Miffy's Garden*. Sanoma Media Netherlands BV, 2015.

Bruza, Michael. *Even Monsters Get Sick*. Busy Bee Studios, 2014.

Bryan, Ed. *Cinderella*. Nosy Crow, 2011.

---. *Goldilocks and Little Bear*. Nosy Crow, 2015.

---. *Jack and the Beanstock*. Nosy Crow, 2013.

---. *Little Red Riding Hood*. Nosy Crow, 2013.

---. *Snow White*. Nosy Crow, 2015.

---. *The Three Little Pigs*. Nosy Crow, 2011.

Cali, Davide. *Each to His Own*! Paramecio Studio, Kite Edizioni Srl, 2013.

Callander, Bronwyn. *Treetop Ted*. Frubeez, 2011.

Carroll, Lewis. *Alice for the iPad*. Atomic Antelope, 2010.

Carson, Mary Kay. *Bats! Furry Fliers of the Night*. Bookerella, 2013.

Chipper's Rainy Day Adventure. Invent-A-Tale, 2012.

Conn, Alexandra. *Puppet Masterpiece Theatre*. Organa, 2012.

Cronin, Doreen and Harry Bliss. *Diary of a Worm*. Tumblebooks. 2010.

Davies Benji. *Bizzy Bear Builds Builds a House*. Nosy Crow, 2012.

---. *Bizzy Bear on the Farm*. Nosy Crow, 2012.

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de Rooij, Sieneke, and Tineke Meirink. *Who is That Little Kid?* Tizio BV, 2013.

De la Haye, Amy, and Emily Sutton. *Clara Button and the Magical Hat Day*. V&A and MAPP
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Doyle, Bill, and Daniel Guidera. *My Dad Drives a Roller Coaster Car*. Crab Hill Press, 2011.

Doyle, Bill, and Troy Cummings. *Don't Open Before Christmas*. Crab Hill Press, 2012.

---. *Nash Smasher*. Crab Hill Press, 2011.

Flesser, Simon, and Magnus Gordon Gardebäck. *Beat Sneak Bandit*. Simogo, 2012.

---. *Device 6*. Simogo, 2013.

---. *Year Walk*. Simogo, 2013.

Fox, Annie. *Middle School Confidential*. Electric Eggplant, 2011.

Francis-Browne, Peter and Rita Gianetti. *Toucan, Toucan't*. Top That! Publishing plc, 2012.

Franco, Blandina, José Carlos Lollo. *Quem Soltou o Pum?* Companhia das Letras, 2013.

Gay, Marie Louise. *Stella and Sam Story Pack*. Zinc Roe, 2011.

Good Night Dadas! Elastico Srl, 2014.

Goosed-up Rhymes. Brain Freez Entertainment, 2010.

Haughton, Christopher. *Hat Monkey*. Fox & Sheep. 2015,

Hawkins, J.M. *Pat the Cat*. JM Hawkins. 2013.

Homer. *The Voyage of Ulysses*. Elastico srl, 2013.

Howard, Jono and Baillet, François-Marc. *A Sweet Story*. Global Mechanic Media, 2012.

Hughes, Martin. *Monster's Socks*. Jordan & Martin, 2012.

Hullinger, Andy and John Solimine. *Dragon Brush*. Small Planet Digital, 2012.

Ickypen. *The Icky Mr. Fox*. Ickypen, 2012.

Jack and the Beanstock. Ayars Animation Inc., 2010.

Jansson, Tove. *Moomin, Mymble and Little My*. Spinfy, 2013.

Jeffers, Oliver. *The Heart and the Bottle*. HarperCollins, 2010.

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Appendix B: Walkthrough of *The King's Ears*

Navigation Icons

Menu icon: located at the top of the screen. Tap or drag down to pull down menu

Menu banner containing page thumbnails: Swipe through screen thumbnails, tap to go to corresponding screen in the app. Tap anywhere on screen to retract menu.

Information button on half-title screen: tap to go to the credits screen.

Previous and **next** screen buttons.

Sound button to toggle narration on and off.

Close page button: Found only on the activity and credit screens. Touch it to return to the screen you came from.
- the flute game returns to the screen with the flute hint
- the cat haircut screen X returns to the cat-cut hint screen.
- the X on the credit screen returns to the half-title screen.

Reload button: Touch to start page at the beginning again for children who would like to repeat the interactions, animations and sounds.

Cover Summary: On the cover, the king is pictured staring unhappily into a mirror. Theme music plays and a bird flies across the screen towing a banner that says, "Read by Terry Jones."

Interaction:

- The sounds and animation on this screen are automatic. Interaction is limited to a next-page button.
- Discussion: The narrator is the famous comic actor Terry Jones. His name is stated in the narration plus shown on the banner in the animation to emphasize his importance.

Issues: The narration is often too quiet throughout the app. The relative volumes of narration, music, and sound effects will be adjusted before publication.

Figure 13. *The King's Ears* **cover screen**

Half-Title Summary: On the half-title screen the bird enters at the same height it exited the cover screen to create a feeling of continuity from one screen to the next. Music continues from the cover and fades out. The bird lands above the information button and pecks at it to draw the player's attention.

Interaction:

- Touch the information ("i") button. It turns red and takes you to the credits screen at the end of the app.

Figure 14. *The King's Ears* **half-title screen**

KE2 Summary: On this first story screen, we are introduced to two of the three main characters: King Boyan and the bird.

Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- Touch anywhere on the frame to make the king blink; touch again to make him cry a single tear.
- Listen to the sound of the tear splashing into a puddle of tears.
- Drag the bird to make it fly around the screen; let her go and she will land on the frame or the wainscoting.

Discussion: The king is first shown inside a frame. He is trapped in an obsession with his appearance and the fear of being judged keeps him a prisoner. In contrast, the unselfconscious bird is free and can fly anywhere she wants. The king's tears land offscreen and make different splashing sounds as if into
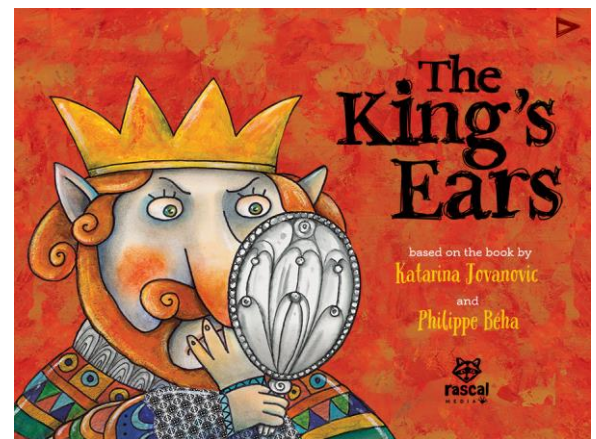

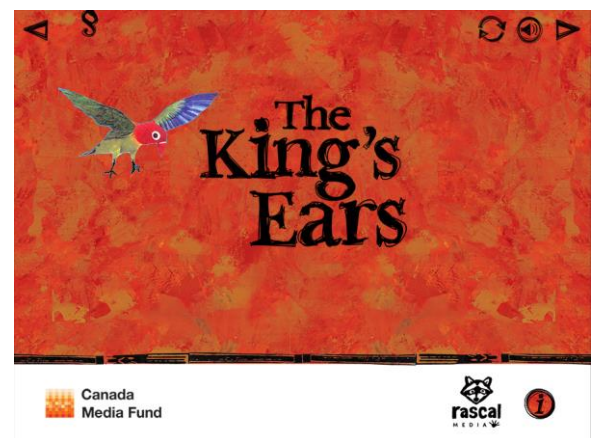**Figure 15.** *The King's Ears* **screen 2 (KE2)**

water. The sound of splashing tells us that many tears have accumulated, ergo the king has been crying for a long time.

Issues: Bird animation to be replaced with improved ones.

KE3 Summary: We learn the reason the king never leaves the palace is because he doesn't want anyone to see his goat ears. Barbers who have seen the king's ears are never allowed to leave the palace again. The people are starting to wonder what's going on.

Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- Touch anywhere on the king or his reflection to alternate from the king seeing his ears and being displeased, to hiding his ears and being happy with how he looks without them.

Figure 16. *The King's Ears* **screen 3 (KE3)**

- Listen to his sounds of pleasure and displeasure.
- Touch the bird to make her ruffle her feathers. Touch her again to make her walk across the frame and lean forward. Touch the bird again to makes her drop down to kiss her reflection and make a kissing sound.
- Additional touches cause her to kiss her reflection again. Swipe up to make her right herself and walk back to her start position at the right of the frame.

Discussion: This interaction takes the king's feelings about his appearance to a universal level; many will identify with the act of looking in the mirror with dissatisfaction and imagining an improved self. The correspondence of happy face with happy sound, and annoyed face with annoyed sound are instructive for children with autism spectrum disorders. The bird's amusing happiness with her reflection contrasts with the king's unhappiness with how he looks.

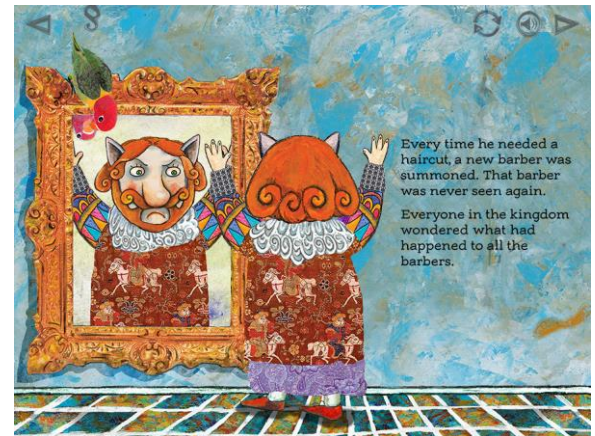Issues: Kissing sounds to come. Wing flutter speed needs adjustment.

KE4 Summary: The king peeks out the window of his palace and worries that people are talking about him.

Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- Touch the king or the curtains to make the king hide or peek out.
- Listen to his sounds of fear and worry.
- Drag the people and the cat around the screen. Notice how characters who are dragged close and are facing each other will whisper. Pull them apart to stop them whispering. Characters will flip over to

Figure 17. *The King's Ears* **screen 4 (KE4)**

face the direction they are dragged.

- Listen to each character's different voice. Notice that what they say is unintelligible. Each additional character added to a whispering group adds its voice, so the scene can get very loud.

Discussion: The necessity of being close and face-to-face to have a conversation models behaviour for children with autism spectrum disorders. The whispers are incomprehensible because we hear them as the king does. Even though he is too far away to understand what people are saying, he worries it's not good. This mirrors the common social experience of both adults and children of hearing whispers but not well enough to understand what is being said. People who worry about what others think of them may assume that whispers they don't understand are both about them and critical.

KE5 Summary: The screen opens with a glum barber facing glum pigs. Now that he has seen the king's ears, he cannot be allowed out in case he reveals the king's secret. In his hand is a pair of scissors, which he snips compulsively.

Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- Touch the heartless pigs and see them laugh at the barber's plight.

Figure 18. *The King's Ears* screen 5 (KE5)

- Touch the piglet to see her run to the barber
- and put her hooves on his knees to comfort him.
- See the wiggling cloud shape hinting in the barber's ear. Touch to make it expand into a thought bubble that contains his selective memory of being the king's barber.
- Listen to him sigh and smile wistfully.
- Touch the bubble again to tap through a slideshow of the mistake the barber made after he saw the king's ears. When the bubble disappears, the heartless pigs laugh and the barber looks glum again.

Discussion: What starts as a wistful recollection of being the king's barber turns into an unpleasant memory of a disastrous chain of events. One of those groaning, if-only-I-hadn't-done-that moments.

KE6 Summary: The screen shows Miro, the last barber in the kingdom, cutting someone's hair (off screen) at a furious rate. Igor, his boy apprentice, is practicing on the cat.

Interactions:

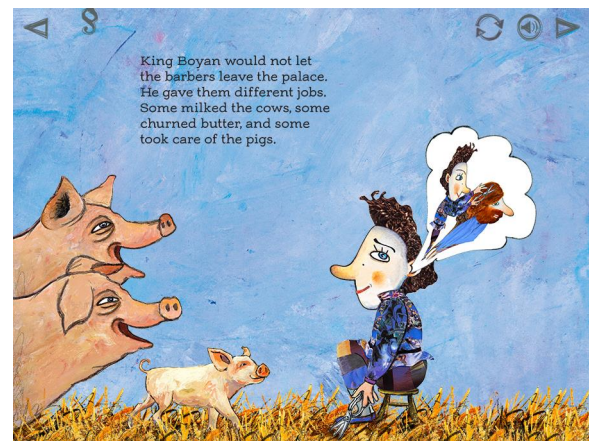- Read the story text. Touch the sound button to

Figure 19. *The King's Ears* screen 6 (KE6)

103

listen to the narration.

- Touch the hen nesting in Miro's hat and watch her flap her wings. Listen to her squawk.
- Touch Igor to show a speech bubble inviting the player to help him cut the cat's hair.
- Notice the cat's waving tail is inviting you to pet the cat. Touching her opens a cat-haircut activity screen.

KE7 Summary: Cat haircut activity.
Interactions:

- Drag scissors to the cat and use a pinching motion to cut hair.
- Listen to the snipping sound and see the clumps of fur disappear in a spray of clipped hair.
- Notice how cutting the cat's hair reveals little scruffy patches until the cat is entirely bald.
- Listen to the cat purr.

Discussion: Purring is a special sound that means happiness. The cat purrs throughout because she is happy to be with Igor (and the player). This interaction is fun because the cat looks increasingly

Figure 20. *The King's Ears* **screen 7 (KE7)**

ridiculous as her hair is cut, but it is significant because it contrasts with the king who is so unhappy about his appearance that he becomes socially disabled. This screen also shows us that Igor is terrible at cutting hair. This screen has scissors for both right- and left-handed players.

KE8 Summary: Back in Miro's barber shop, three loud bangs invite the player to open the door.
Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- Open the door and a soldier will enter. Touch him to show his speech bubble, "The King commands . . ."
- Drag on the sheep to make them bounce and baa.
- Touch Miro to make him faint and the chicken flutter off.

Figure 21. *The King's Ears* **screen 8 (KE8)**

- Touch the cat. She will step off the upturned bucket, do a downward-facing dog stretch and walk to the fallen barber to lick his face and purr to resuscitate him. Each touch makes the cat lick Miro again.
- Drag the screen to the left to show Miro's young customer. Drag to the right to show the chicken sitting on a nest. Touch the chicken to make her squawk.
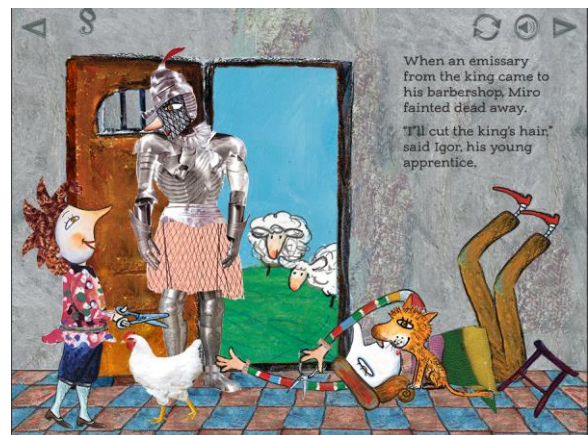
KE9 Summary: Igor is at the palace and about to cut the king's hair. The bird is flying back and forth carrying an egg.

Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- Touch Igor to make him raise his hands to start to cut the king's hair. Watch Igor raise the scissors then drop his hands and shyly shake his head. With each touch Igor raises his hands further until on the third touch he begins to cut.

Figure 22. *The King's Ears* **screen 9 (KE9)**

- See the bird fly in carrying an egg after Igor starts to cut.
- Cutting away the king's hair reveals his ears and makes them pop up. See Igor's surprised (and silent) reaction.
- Touch Igor to make him stop cutting and tap the comb on his mouth, thoughtfully considering the haircut. Touch him to resume cutting.

Egg game: After Igor starts cutting, the bird flies onto the screen carrying an egg. Tapping the bird midflight or dragging her and letting go will cause her to drop the egg. If aimed correctly, eggs will break on the vase of flowers, the painting, and Igor's stool, and will bounce and roll off the king's stomach. The bird makes ten passes across the screen and her appearances are randomized to increase the challenge of the game.

Discussion: This game can be seen as shamelessly ornamental, messy fun or interpreted as an observation that life is chaotic. Being a powerful king and locking yourself in a palace can't prevent that. A character who introduces chaos is often seen in fiction, including picturebooks (e.g., Seuss's *The Cat in the Hat)*.

Issues: Igor and the king animations are misaligned. Sounds to come are the scissors snipping, and the king's and Igor's nonverbal vocalizations.

KE10 Summary: Igor has completed his first job as the king's barber. There are broken eggs everywhere and the king's hair is a fright, but the king is happy because Igor didn't laugh at his ears. Igor is happy because he is satisfied with his own efforts in life.

Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- Watch the king examine his reflection while Igor fidgets.
- Touch the king and Igor to show their dialogue bubbles.

Figure 23. *The King's Ears* **screen 10 (KE10)**

- Drag the bird to make her hop around the room.

KE11 Summary: Igor feels the pressure of keeping the king's secret. A pressure gauge represents Igor's internal state.

Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- Drag the point of the needle on the dial to increase and decrease Igor's feeling of pressure. Dragging the needle towards the red zone causes Igor to get redder and his eyes, cheeks, and mouth to bulge.

Figure 25. *The King's Ears* **screen 11 (KE11)**

- When the needle is dragged to the maximum there is a sound of a factory steam whistle.
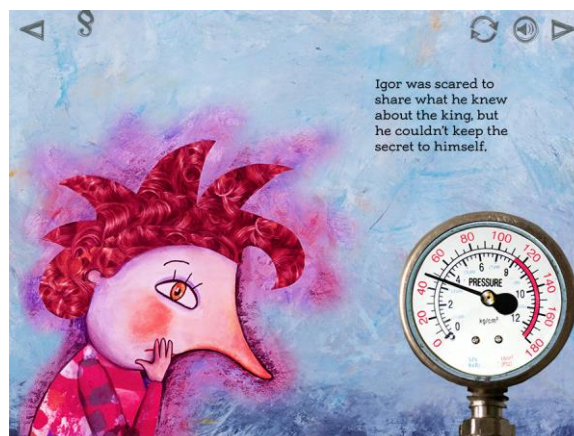
Issues: Igor's nonverbal vocalizations still to be added.

KE12 Summary: Igor is desperate to relieve the pressure of having to keep an adult secret and decides to bury the secret in the meadow. When Igor shouts in the hole, letters fly around the screen. The player can drag the letters to write the king's secret or anything else.

Interactions:

- Read the story text. Touch the sound button to listen to the narration.

- Touch Igor's nose on the left side of the screen and watch him run in, then stop and hint that he

Figure 24 *The King's Ears* **screen 12 (KE12)**

wants to dig. Igor hints by assuming a digging pose while looking at the player and repeatedly raising his eyebrows.
- Touch Igor to play an animation of him digging the hole. Listen to the sound of the shovel. See Igor kneel down and put his head in the hole.
- Touch Igor's head to make him shout the king's secret. Watch letters of the alphabet fly out of his mouth and all over the screen.
- Drag letters to spell words.
- See how Igor's desperate expression has been replaced with one of relief. Touch the kneeling Igor and watch him rise with a smile on his face and leap over the hole. Igor hints that he's ready to fill in the hole by assuming a shovelling position and looking at the player.
- Touch Igor to make him fill in the hole. Igor makes a happy Ta da! gesture after filling in the hole. Touch to repeat Ta da!

Issues: Igor's nonverbal vocalizations are still to be added.
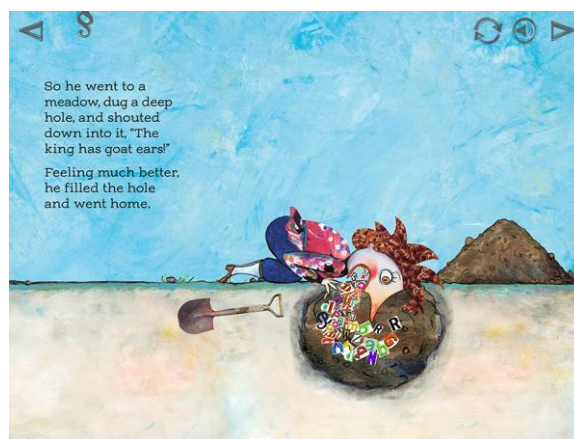
KE13 Summary: Igor is on one of his regular visits to cut King Boyan's hair. He urges the king to come out of the palace to go to the village fair. Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- When the screen opens, Igor is juggling some barbering tools: brush, comb, razor and shaving brush. Swiping the spinning tools in the direction they are turning makes them spin faster; swiping against the direction of the spin makes the tools turn slower until they stop and fall to the ground.

Figure 26. *The King's Ears* screen 13 (KE13)

- Use the reload button to restart the page and see if you can slow down the spinning tools, then speed them up again just before they fall to the ground.
- Touch the king's head to cycle through the four crazy hairstyles Igor has given him.
- Drag the bird out from behind the curtain and help her hop around the room. Drag her right to the edge of the hair clippings on the floor or to the edge of the right side of the chair and let go. She slides behind the clippings or the chair. The hair clippings move and rustle while the bird is behind them. A second later, her head peaks out again and she is now wearing a wig made of hair clippings. Drag her out to hop around the room. This can be repeated to see four different bird wigs.
- When the narrator says "King Boyan was curious," see the king look away from the mirror with an expression of interest.

Discussion: On this screen we see the continuing relationship of Igor and the king. Now that he no longer carries the burden of the king's secret, Igor is again a carefree boy who does not yet have a very grownup attitude to being a barber. In happy contrast to the king, Igor and the bird are not worried about appearances. This difference is illustrated in a fun way through the interactions and animations.

Issues: Nonverbal vocalizations still to come.

KE14 Summary: On a previous screen, Igor shouted the secret into a hole in the meadow, then filled it in and went home. On this screen, we discover something Igor doesn't know: reeds grow from the same place where he buried the secret. But the bird sees events that neither the king nor Igor see. When players touch the patch of earth to make the reeds magically grow, they become privy to the same events that the bird witnesses.
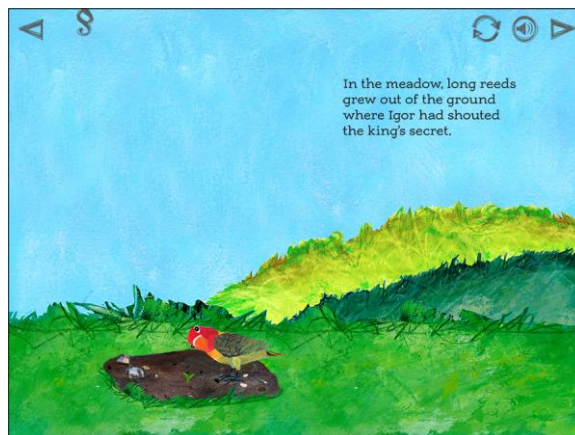

Figure 27. *The King's Ears* screen 14 (KE14)

Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- When the screen opens, the bird twitches to invite the player to touch her. This will start her animation of pecking and walking towards the patch of dirt. As she reaches the edge, a tiny green sprout pops up, and when she goes closer to investigate, the sudden growth of the sprout makes her jump back and squawk.
- Continue to touch the patch of earth until nine reeds grow and the bird flies away.

KE15 Summary: Two shepherds happen upon the reeds. Their sheep are grazing. The bird flies in a second later. One shepherd's speech balloon says, "I wish I could make a flute." The other shepherd's balloon says they need to cut a reed first.
Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- Touch each sheep to make it baa.
- Touch the bird to make her peck.
- Touch the shepherd on the right to show his speech bubble.

Figure 28. *The King's Ears* **screen 15 (KE15)**

- Read his offer to show his friend how to make a flute.
- Watch to see the hint of the jiggling knife in the hand of the shepherd.
- See and hear a reed quiver, which is a hint to cut it.
- Drag the shepherd's knife to cut the reed. Watch the reed fall.
- Watch the bird's head follow the shepherd's hand.
- Observe that a flute hint now jiggles in the speech balloon of the shepherd on the left.
- See two more reeds quiver to hint that they can be cut.
- Drag the shepherd to make him walk to cut the reeds on the edges of the clump of reeds.
- Touch the jiggling flute to open the flute activity screen.

Discussion: This and the next screen act as a rehearsal for physically making a reed or bamboo flute.

KE16 Summary: Activity of making a flute, composing a tune, and recording it.
Interactions:

- Read the instructions on how to make a flute.
- To trim reed, use your finger to cut the tip and leaves. The tip of the reed falls away with one cut, unlike the leaves, which can be gradually
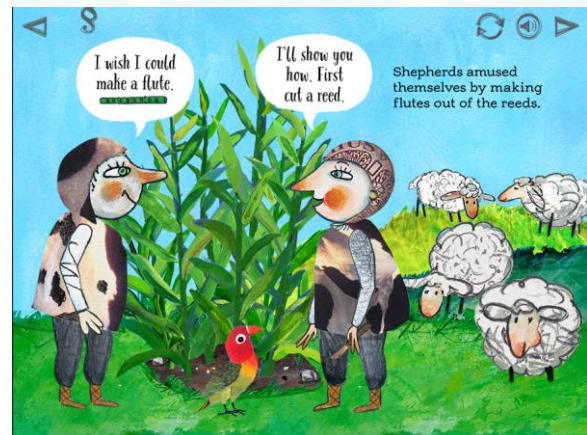

Figure 29. *The King's Ears* **screen 16 (KE16)**

- cut away a bit at a time.
- Once cut off, leaves can be dragged around and swept off the screen.
- To drill eight holes, touch the reed stem and holes will grow.
- Record a tune by touching the red button. It will turn into a red square while it is recording. Touch again to stop recording.
- See an icon that looks like a scrap of musical notation appear for each tune. The notes, tempo, and rhythm are recorded as played.
- Touch tune icons to play back tune. The icon will have an orange outline while playing.
- Touch again to stop playing. You can play more than one recorded tune at a time.
- Remember your last recorded tune. You will hear it when a flute is played on two subsequent screens.

Discussion: This is the second of two activity screens, the first being the cat-haircut screen. On this screen, the player reads the instructions on how to make a flute. Because the activity is a rehearsal for making a real reed flute, the very first instruction is to cut off the tip because you cannot make a flute if air cannot be blown into one end and out the other. Cutting off the tip is more important than cutting off the leaves and, in fact, the flute will sound as long as the tip is cut off and a single hole is drilled. Notes can be played one at a time or simultaneously. Up to five tunes can be recorded. The tunes are saved as miniscule code files inside the app, not sound recordings. Recorded tunes will be kept until dragged to the trash, even if the app is closed and reopened. The last recording on this screen will be the tune that will be heard on following screens when a flute is touched. But the tune will be as a voice singing, "The king has goat ears."

The lovely sounds for this flute were created by the superb jazz flute and sax player, Tom Keenlyside, as was the pretty run-up sound of the first reed sprouting in the meadow. Amazingly, it was quite difficult to get a beautiful, in-tune, warm woody flute scale before I asked Tom. The first musician I engaged could not manage to be both in tune and create the warm woody sound I was looking for. But, Keenlyside created two perfectly-in-tune octaves on an instrument chosen from his extensive wooden flute collection. Without being asked, he thoughtfully sent a choice of files: one with no vibrato, and one with a little vibrato. What a difference! With no vibrato, the notes sounded a little mechanical, but the vibrato notes sounded alive, exactly as a magic flute should.

For the child player, creating and recording a tune on this screen is an act of co-authoring that has implications backwards and forwards in the story. Players will be pleasantly surprised to hear the last tune they recorded play on KE17 and KE19. The player, hearing his or her own tune transformed into the voices of magic flutes singing the king's secret, a miraculous event that leads to the king's epiphany, will experience a powerful act of coauthoring using the mode of music, as well as possibly a first experience of composing for the voice. The player will learn through experimentation that for the characters' flutes to sing the entire phrase, they must compose one note for each of the five words "the king has goat ears," and that the number of notes in their tune must be in multiples of five. On this page, you can record up to five tunes. Deleting tunes by dragging the icons over the trash bin allows you to record more or to change which tune is in the last position, as the tune in the last position will be the one that is played on subsequent screens. While on this screen, you can also

play more than one recording at the same time, potentially creating little orchestrations with harmony and counterpoint, as well as fugues (e.g., "Row, Row, Row Your Boat"). Conceivably, the musically inclined could become quite good at this game.

Lead programmer, Judy Ng, accomplished miracles with this difficult screen, devising ingenious, light-weight programming solutions for cutting up sprite objects (the leaves), and recording and saving tunes.

KE17 Summary: Having made the flute, the two shepherds enjoy some music.
Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- Touch the shepherd with the flute to see and hear him play an experimental note.
- Touch again to start him playing the flute.
- When the shepherd plays the flute, hear a voice singing, "the king has goat ears" to the tune last recorded in the flute activity instead of flute sounds.

Figure 30. *The King's Ears* **screen 17 (KE17)**

- Read the seated shepherd's speech balloon inviting the player to tap on him to change the tempo of the tune.
- Tap the seated shepherd to change tempo of tune, clapping, and dancing. It takes three consecutive taps to establish a new faster or slower tempo.
- Touch the flute shepherd to stop.
- Watch the shepherd and sheep dance and listen to how the tune sounds at different tempos.
- Drag the flying bird and release so she'll land on the closest sheep or the ground.
- See how the bird will hold on no matter how fast the sheep dance.

Discussion: Making the flute, composing a tune, hearing it played and then sung, and adjusting the tempo are interactions that address musical literacy. The flute activity may also be the first experience for many players of composing for the voice. If no tune was recorded, the voice will sing to the app's default tune.

Issues: Sounds to come include the experimental flute toot. Where the bird lands on the sheep needs to be tweaked.
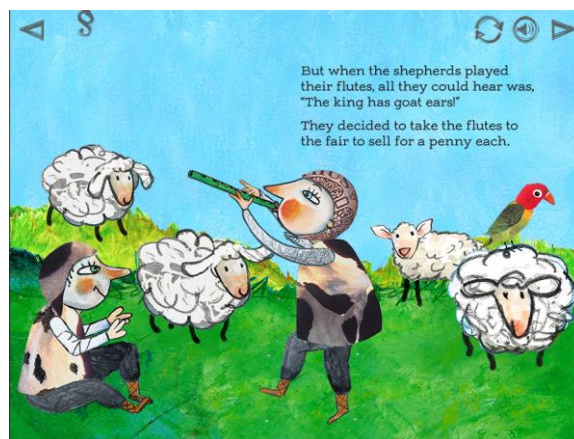
KE18 Summary: Encouraged by young Igor, the king drives to the fair. The frightened king stays behind the heavy curtains of the carriage.
Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- When the screen opens the horse whinnies and paws the ground to hint that it wants to be dragged onto the screen. Drag the horse to pull an animated coach and horses onto the screen.

- Observe the carriage knock the apple man and spill his apples.
- Read the apple man's speech balloon, "Can you help me pick up my apples?"
- Drag all the apples to the basket, moving the carriage to see if any are hidden behind it. The apple man blows a kiss of thanks when all the apples are back in his basket.
- See the curtains quiver because the king is shaking with fear.
- Touch the curtain to make the king peek out. Touch the king to make him hide and make an unhappy yelp.
- Touch the horse's hindquarters to make her poop. Notice how the bird squawks when the horse poops.
- Touch the bird to make her squawk and move.
- Drag the bird to make her sidestep across the top of the carriage.
- Dragging the carriage to the right and off screen will cause the next screen to open.

Issues: Horse tail animation too slow. Bird may move unexpectedly.

Figure 31. *The King's Ears* **screen 18 (KE18)**

KE19 Summary: The carriage stops in the middle of the fair. Three children have the reed flutes.
Interactions:
- Read the story text. Touch the sound button to listen to the narration.
- Touch the children to make them play their flutes. Notice that instead of flute sounds, the flute sings, "The king has goat ears" to the tune of the last recording in the flute activity.
- Notice how timing the touch of each child can make them sing in unison, a round, or randomly with serendipitous harmonies.

Figure 32. *The King's Ears* **screen 19 (KE19)**

- Touch the children to make them start and stop playing.
- See the people smile at hearing the king's secret sung out loud.
- After the first child starts playing, watch the bird fly down to sit on Igor's arm and whisper in his ear. Notice that the dancing exclamation point in the bird's speech balloon hints at an urgent message.
- Touch the dancing exclamation mark in the bird's bubble, then tap through a series of three images which summarize the chain of events leading up to the leaking of the king's secret.
- Touch a third child. The guard will grab one of the boys. See the people react.

- After the guard grabs the boy, stop touching the bird's speech balloon. In a few seconds, the bird will fly away, pooping in protest on the guard's head as she flies over him.

Discussion: When the bird tells Igor about the events that led up to the king's secret being revealed at the fair, Igor's expression shows his distressed reaction. Later we learn he also feels responsible.

KE20 Summary: The king shows his ears. When the guard on the previous screen grabs a little boy for playing the king's secret, the king responds to this injustice by acknowledging the truth of the flute's song.

Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- Touch the bird to make her squawk and move.
- Touch the curtains of the carriage and see the king come out and say "It's true!" as the bird flaps her wings and crows triumphantly.
- Listen to the people gasp.
- Touch the king again to repeat "It's true."

Figure 33. *The King's Ears* **screen 20 (KE20)**

Discussion: This is the turning point in the king's life and the climax of the story.

KE21 Summary: Igor is pacing in the palace waiting for the king to return.

Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- When the screen opens, Igor is pacing. Tap him to make him gesture anxiously.
- The sound of the king's carriage driving up and the king walking through the castle makes Igor freeze and listen. Touch him to see different anxious gestures.

Figure 34. *The King's Ears* **screen 21 (KE21)**

- The king walks in and Igor sinks to the floor in front of him and starts to cry. The Mona Lisa cries too. Tears start to fill the room. Touch the king to make him bend forward and show his speech bubble, "Thank you." Igor stops crying and the tears drain away.
- Or wait to touch the king, in order to see how high the water will go. When the water gets high enough, the bird will float across the screen in a rowboat, or sometimes go by in a submarine pedalo.
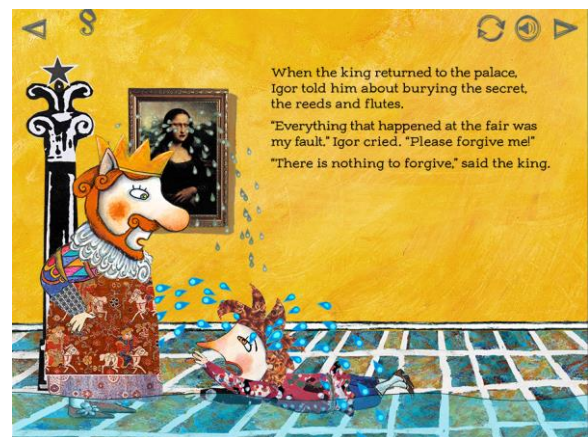
Discussion: The king's simple "Thank you" is deliberately brief to prompt a discussion of why the king is thanking Igor instead of being angry with him.

Issues: Igor's nonverbal vocalizations to be added.

KE22 Summary: Some of the barbers who were forced to take care of the pigs realize they want to keep doing it.

Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- Observe the hint of the barber's brush moving up.
- Drag the brush up to change hairstyles. Listen to the pig's responses.
- Stroke the nose and ears of the pig to make them move.

Figure 35. *The King's Ears* screen 22 (KE22)

Discussion: This penultimate screen expands the idea of hair styling as concern with appearance to include the intimate pleasure of grooming and being groomed as an expression of friendship.

KE23 Summary: On this last screen, King Boyan leaves his picture-frame prison and is free.

Interactions:

- Read the story text. Touch the sound button to listen to the narration.
- See the king gesture for help to get out of the frame.
- Drag the king up and out of the frame.
- The king hovers, flapping his arms. Drag him around the room. Dragging him to the right edge of the screen will cause the background to move over and show more of the open window.

Figure 36. *The King's Ears* screen 23 (KE23)

- The king can be dragged out the window. He will momentarily vanish to the left, then appear again, flying back and forth in the distance, silhouetted against the bright sky. The bird follows him.
- Listen to music fade in, signalling the story is over.

Issues: King should flap more frequently when flying outside the window. Sounds of the happy king and surprised people to come.

Overall App Issues

As I neared the final third of creating assets for the app, I became increasingly uncomfortable with the fact that all the people in Béhà's illustrations are white. I checked with the book publisher and he felt it would be more than okay to make some characters brown. I just wish I'd felt more ownership of the images as the adapter of the book at the beginning of the project, because I now feel it would have been very appropriate to make young Igor brown. Now there are hundreds of Igor sprites and changing each of them while trying to maintain overall colour consistency would be impossible to
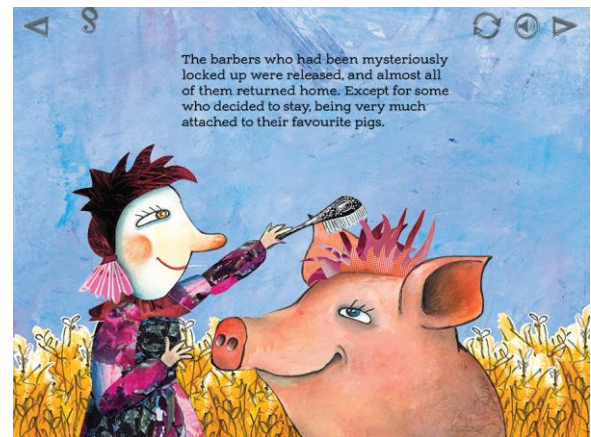
113

do well and within a workable time frame. So unfortunately, only minor characters with not too many animation sprites can be made brown.