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7

TOUCH DESIGN AND NARRATIVE INTERPRETATION

A social semiotic approach to picture book apps

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Interactivity is often considered as the defining feature of a book app. However, what constitutes interactivity in the context of apps is not always clear. We postulate in this chapter a multimodal social semiotic theory of interactivity, which considers interactivity as not simply a function of technology, but also a resource for meaning-making. We distinguish two basic types of interactivity—intra-text and extra-text—incorporated in the touch design, and explore the different functions they perform in a broad range of picture book apps. In particular, we look at the app version of *The Heart and the Bottle* in depth, and illustrate how interactive design elements help to create an interpretative possibility of the story. We suggest that a better understanding of interactive touch design would promote more effective adult-child interactions around mobile applications.

Keywords: Interactivity, multimodal, e-book, literacy, semiotic, meaning-making

Introduction

As a unique aesthetic and literary artefact, picture books have occupied a central place in contemporary early childhood. They provide, for many young children, the earliest literacy experience. Joint picture book reading between caregivers and young children is one of the most effective strategies for fostering emergent literacy and has profound implications for the long-term literacy development, as shown by a rich body of research evidence (e.g., Bus *et al.*, 1995; Mol *et al.*, 2008). The value of picture books for promoting literacy learning has been further highlighted in the multiliteracies pedagogy movement (e.g., Hassett and Curwood, 2009; Walsh, 2003). As narrative in picture books relies largely on the sophisticated

interplays between verbiage and image (e.g., Lewis, 2001; Nikolajeva and Scott, 2013; Painter *et al.*, 2012), it not only introduces young children to the conventions of print, but also provides them unique opportunities to engage with multiple meaning-making modes such as language and image, resources such as font, colour and layout, and multimodal narrative genres.

As smart phones and tablet computers become increasingly ubiquitous in early childhood, a variety of new forms of 'picture books', such as animated e-books, enhanced e-books, and book applications (or apps) have been made available to young readers. These emerging digital literacy artefacts have brought into question the role of picture books in early literacy. Many advocates consider digital books an improvement on physical picture books, believing that they have the potential to provide new literacy learning opportunities. In their recommendation to teachers, for instance, Hutchison *et al.* (2012, p. 17) suggested that the variety of electronic books available for the iPad provided additional advantages over paper media books, since they afforded students more opportunities to physically interact with and manipulate and transform texts according to their needs and interests.

The sceptics, on the other hand, are concerned that an over-reliance on digital technologies could deprive children of a range of literacy skills that are traditionally developed through engagement with print-based picture books. Enhanced e-books have been reported as being less effective than the print and basic e-book versions in terms of their capacity to support the benefits of co-reading, because they prompted more non-content-related interactions (Chiong *et al.*, 2012; Parish-Morris *et al.*, 2013). In an interview, Mem Fox—a leading Australian picture book author—criticised the mobile app as it 'has no beginning, middle or end, and did not describe forgiveness or courage in adversity' and expressed concern that 'an increasing reliance on technology to teach children how to read could inhibit their empathy and social skills' (Stark, 2013).

The purpose of our chapter is not to take a side in this ongoing debate. Rather, we aim to tackle one of the most basic questions of the debate—how (and if) the picture book app is different from a print book. We believe that a systematic understanding of these emerging digital textual artefacts needs to be developed before we can fully examine the 'losses and gains' (Kress, 2005, p. 6) involved in introducing them into young children's literacy lives. The disciplinary approach we take here is often referred to as (multimodal) social semiotics (Halliday, 1978; Kress, 2009; van Leeuwen, 2005). From this perspective, picture book apps are a semiotic artefact, consisting of various semiotic or meaning-making resources and modes, as well as touch designs. The main task of a social semiotic analysis is to unpack how these various resources have been deployed and how they interact with each other, to make meaning in the narrative context of a picture book.

Between books and apps: Picture book apps as multimedia artefacts

Electronic picture books exist in three typical formats. The first is an e-book, a straightforward digitalisation of the picture book. Some e-books, such as *Mog the*

Forgetful Cat (1970), include read-to-me audios (i.e., the audio recording of an adult reading the book). The second format, which is less common, is an animated or enhanced e-book, in which the original illustrations have been animated. Judith Kerr's 1968 classic, *The Tiger Who Came to Tea*, for example, has been adapted as an animated e-book. Enhanced e-books often contain simple touch functions, such as 'tap to play a video clip'. Picture books can also be turned into a book app—a digital book designed for touch devices, such as tablet computers and smart phones. While e-books and animated e-books are distributed through, and need to be read with, a reading app, e.g., iBook or Kindle, picture book apps are stand-alone mobile applications. Although many picture book apps are the adaptations of existing books, some have been developed independently of a print version (for examples see Sargeant, 2015).

While there are a number of characteristics that distinguish picture book apps from other e-book formats (Kucirkova, 2013), the two focused on here are multimodality and interactivity. To understand the multimedia nature of picture book apps, one useful concept is remediation (Bolter and Grusin, 2000), the idea that digital new media are often fashioned out of older forms of media. Picture book apps are foremost a 'remediation' of the print book. The type of remediation involved typically falls into one of two categories. The first is what Bolter and Grusin describe as 'translucent borrowing', in which the digital medium is presented as a similar, yet 'improved', version of an older medium (2000, p. 46). The second is 'refashion(ing)' in which the digital medium attempts to refashion the older medium/media entirely, while 'still marking the presence of the older media and therefore maintaining a sense of multiplicity or hypermediacy' (2000, p. 46).

When a picture book app is a 'translucent borrowing' of the print book, it maintains the defining features of the print version while incorporating other types of media, such as audio, animation, and interactive games. One such example is *The Wrong Book* app, which is designed as a virtual book with add-on features such as sound effects, motion graphics, and animated characters. When a picture book app 'refashions' the print version, it creates an entirely new (multi)-media experience, while maintaining a sense of reference to the book. *Don't Let the Pigeon Run the App*, for instance, is an app based on Mo Willems' Pigeon series (e.g., *Don't Let the Pigeon Drive the Bus*). While the app maintains the defining features of the books, such as the design style of the characters and narrative pattern, the written words are now delivered through audio by an animated pigeon. Significantly, this transforms the experience from one of 'reading' to one of 'watching'. In this new version, the user is positioned as if they were in 'face-to-face' dialogue with the character, while in the print version the young readers need to infer an imagined dialogue with the pigeon, by decoding the visual and verbal clues within the book.¹

Regardless of the degree of remediation, a picture book app never fully 'absorbs' the print media. Nevertheless, an important characteristic of a picture book app is that it remains a 'book'. There are many elements in picture book app design that help create a sense of continuity with the print book, even in apps that have been developed without an original book version, such as the *Larry the Lizard series*. One

common strategy is to design the interface according to the layout conventions of the print version, rather than adhering to those of screen-based media, such as websites. Many book apps also include a flipped-page design on the bottom right of the screen,² which allows the reader to 'turn' the page through a swipe/flip gesture, thus imitating to a degree the experience of physical page-turning. As well as trying to maintain the 'physical' look of the book, many book apps incorporate into their multimedia features the 'discursive norm' (van Leeuwen, 2005) about early literacy and share-book reading practices. For example, one of the common multimedia features in picture book apps is the audio recording function. Parents, teachers, or the children themselves can record their readings of the story, which can be played back at a later time. Though technologically simple, this function promotes app use as a shared and repeatable practice, much like the established early literacy practice of shared picture book reading. In some picture book apps, most notably the *Dr Seuss* series, the readers can tap on individual words that will be then read aloud to them. We suggest this function helps to highlight the decoding and phonic aspect of literacy. More sophisticated use of multimedia features to facilitate forms of early literacy can be found in apps like the *Pigeon*, which incorporates scaffolded learning of story-telling through multimedia interactive elements, where young readers progress from selecting from image options to be incorporated as objects in the story, to the generation of their own choices of objects that they can record, and these are then incorporated into the story.³

In summary, picture book apps can be considered as a distinctive category of multimedia artefact. While they tend to incorporate a broader range of media, they nevertheless remain, to varying degrees, faithful to their origins in printed books. The multimedia features of the picture book app often underpin certain notions of literacy and types of literacy practice. While multimodality is an important feature of picture book apps, what ultimately defines the picture book app and distinguishes it from other formats of electronic picture books is its interactivity, a point we shall elaborate on in the following section.

Interactivity in picture book apps: A social semiotic approach to touch design

Interactivity is often considered as the defining feature of a book app. For an app to be approved for distribution by Apple's App Review Board, it needs to have a sufficient level of interactivity (Sargeant, 2015). However, a review of design and education literature suggests that what constitutes interactivity in the context of apps is not always clear. It can refer to several different but related phenomena, which can be collected under the umbrella term 'interaction' (or 'to interact with'). As mobile apps are designed for touch devices, the most salient form of interaction is to physically interact with or touch the screen, e.g. 'they provide further opportunities for students to *physically interact with* and *manipulate* texts' (Hutchison *et al.*, 2012, p. 17, italics added). A second form of interactivity is sometimes

discussed as a feature of multimodality, with the latter often presuming the presence of the former, e.g., 'tools that can support highly *interactive, multimedia experiences*' (Chiong *et al.*, 2012, p. 1, italics added). A third type of interactivity concerns personalized content creation, e.g., 'with options for the reader to *further interact* by recording and replaying their own voice with the text' (Hutchison *et al.*, 2012, p. 17, italics added). While the first three types of interactivity focus on the interaction with the apps, the term can also refer to interaction around the apps, including the possibility for children to create their own stories (Kucirkova *et al.*, 2013), and talk generated around the story through the use of an app. This latter type of interaction is where many literacy researchers believe the potential of apps, including picture book apps, for fostering early literacy resides (Krcmar and Cingel, 2014). Shuler (2012, p. 30) has proposed that 'we need better data on how to increase positive interactions between parents and children around touch screen technologies' and Falloon and Khoo (2014) have drawn attention to the potential for teacher intervention in enhancing the nature of interaction among young children around iPad apps. There has been some pioneering research in these areas of interactivity. For example, researchers (Kucirkova *et al.*, 2013; Kucirkova *et al.*, 2014) have shown how parent-child interactions around a self-created story with an iPad app can create opportunities for learning.

Perhaps the most sophisticated and systematic account of interactivity to date is that in Salen and Zimmerman's (2004) seminal work on game design, emphasizing that interactivity is a complex and multifaceted notion that encompasses computing, design, physical, psychological, and cultural dimensions. Our discussion of interactivity, however, is much narrower in scope, focusing exclusively on the *touch design*—the areas (known as hotspots or buttons) in a picture book app that can be activated through multitouch gestures (e.g., tap or swipe) to perform certain functionalities. We postulate that one of the primary functions of interactivity, which is largely missing in the existing accounts, is meaning-making. The meaning-making potential of interactivity is particularly relevant in the context of picture book apps. We will use the two examples of touch design in Figure 7.1 to illustrate our points.

A unit of touch design is made up of three elements: 1) the action—typically a multitouch gesture (e.g., swipe, tap, drag, etc.) or less typically other types of physical action, such as shaking the device; 2) the hotspot or button—the area on the interface that can be activated by gestures; and 3) the outcome or the functionality (such as edit, share, audio recording, etc.), triggered by the action. From a technological perspective, to design interactivity is to translate '*standard gesture*' (an action) into '*functionality*' (an outcome) (Apple Inc., 2015). What mediates between a gesture and its functionality in the interface is a button or a hotspot. While the pairing between action and outcome holds the key to interactivity for a designer (cf. Salen and Zimmerman, 2004), a user/reader experiences various forms of interaction primarily through the hotspots, which need to be represented semiotically in the forms of icon, image or verbiage. Our social semiotic account of touch design and interactivity thus centres on hotspots or buttons.

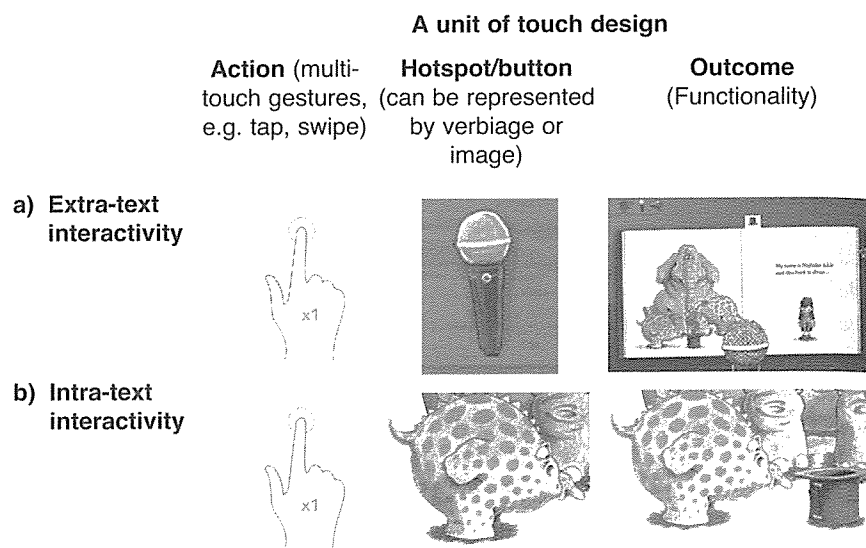


FIGURE 7.1 Touch design: A social semiotic perspective

We distinguish two types of touch design, and each engenders a distinct form of interactivity in picture book apps. In the first type of touch design, as illustrated in Figure 7.1a, the hotspot—the icon of a microphone—‘signifies’ or ‘symbolizes’ the functionality—audio recording. When a user/reader taps the microphone, it is likely that they, by decoding the symbolic meaning of the icon, can predict what the outcome of their action will be. Figure 7.1b is an example of the second type of touch design, where the hotspot does not ‘signify’ or ‘symbolize’ the outcome. Here, when the reader taps on the monster, the monster will tip the hat and the hat will, as a result, wobble. The image of the monster in this case does not represent either of the outcomes: the tipping or the wobbling. The outcome (tipping and wobbling) needs to be interpreted in context of the narrative (the monster’s role in the story). By contrast, in the first type of touch design, the outcome is interpreted solely in relation to the iconic hotspot.

We term the second type of touch design ‘intra-text’ interactivity, while the first is ‘extra-text’ interactivity. Intra-text interactivity is of particular interest to us, as it shows that interactivity is not simply a function of technology, but is also a resource for making meaning in the context of picture book apps. When we perform a physical act such as tap or swipe, we perform a semiotic act or an act of meaning-making at the same time. In the following section, we will illustrate our arguments, using the digital book app *The Heart and the Bottle* (Jeffers, 2009) as an example. Specifically, we compare the app version with the print book version, focusing on what narrative elements have been turned into touch design, and what extra functions have been created through touch design.

Touch design and narrative interpretation in *The Heart and the Bottle*

The Heart and Bottle (hereinafter, *H and B*) is a book by award-winning children’s picture book author and illustrator, Oliver Jeffers, and was first published in 2009. In December 2010, it was made available as an ISO app. Illustrated in the minimalist mixed-media style Jeffers is noted for, the story centres on a little girl’s journey through grief and follows the typical structure of a narrative.⁴ In the Orientation stage, we are introduced to an unnamed little girl ‘whose head was filled with all the curiosities of the world’. She was close to her grandfather with whom she shared her rich intellectual and emotional life. The Complication stage starts with the little girl finding an empty chair where her grandfather used to sit, symbolising his death. Unsure how to deal with the grief, the girl put her heart in a bottle. The second part of the complication sees the girl as a fully-grown woman with a heart in a bottle hung from her neck, who ‘was no longer filled with all the curiosities of the world’. She tried and failed repeatedly to get the heart out of the bottle. Eventually, in the Resolution, the protagonist met another curious little girl who took the heart out for her. The book ends with the Coda, where the woman was able to enjoy a rich inner life again.

In the book, the story is told in a third-person voice and we are not aligned visually or verbally with a particular character’s point of the view. Throughout the book, the little girl—the main Participant—is being represented both verbally in the text and visually in the illustration. However, the types of process involving the girl as the Participant are very different in the verbiage and in the image. Verbally, the main process is the Mental Process, which deals with thinking and feeling (e.g. ‘*She forgot about the stars*’, ‘*Feeling unsure, the girl thought the best thing was to put her heart in a safe place*’). Visually, she is depicted mostly in Action Processes, such as drawing, running, or sawing the bottle. While the narrative is premised on the death of the grandfather, he appears only as a visual Participant, often as the Accompaniment to the little girl’s actions. Neither he nor his death is mentioned in the text.

In terms of interpersonal meaning, while the central theme of the story is emotion, there are few explicitly inscribed instances of Affect in the written text. The feelings of the protagonist are largely invoked, for example, ‘*She forgot about the stars ... and stopped taking notice of the sea*’, ‘*didn’t take much notice of anything ... other than how heavy and awkward the bottle had become*’. The verbally invoked Affects are enforced through the choice of Ambience—the use of colour to construe emotion. For example, the pages depicting the loving relationship between the girl and her grandfather are filled with vibrant and warm colours. The pages where the girl makes futile attempts to break the bottle are largely blank with little colour, except for a few splashes of red, i.e., the heart. In short, the verbiage and image relation in *H and B* is a complementary one, with each playing a crucial role in creating the narrative and meaning. To reach an interpretation of the story requires a reader to make inferences based on visual clues, verbal tokens, and, more importantly, the

complex interactions between the two. For younger readers who are not familiar with the multimodal conventions of picture books, scaffolding support may be necessary for them to form a coherent reading of the narrative and its central theme.

The app adaptation remains largely faithful to the print in terms of the narrative structure, the wording, and illustration. There are two major changes in the app version: 1) layout design—the splitting and merging of the original double page spread into a single screen frame; and 2) the interactive design features. While acknowledging layout as a resource for meaning-making, due to the limitation of this chapter we shall focus exclusively on touch *interactives*.

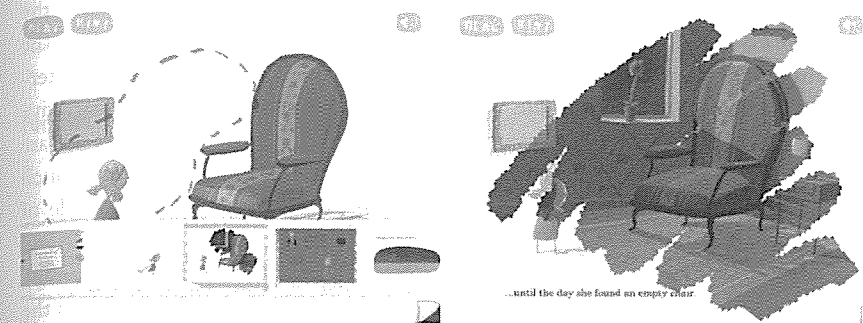
Touch interactives in the *H and B* app

H and B incorporates both types of touch design and interactivity—extra-text and intra-text. Examples of interactive designs are shown in the following Figure 7.2, which contains two frames, the first depicting the death of the grandfather, and the second showing the change of the protagonist from a curious little girl into an impassive grown-up.

Extra-text *interactives* are typically placed on the margin of a frame. In this frame, there are four hotspots: two are indicated by verbiage—*Menu*, *Hint*, and two by icons—the *speaker* icon on the top right and the *flipped-page* on the bottom right. Extra-text touch designs have two typical functions in picture book apps. The first is to enable the navigation and use of the app. When a user taps on the Menu button, for example, a thumbnail index of the app frames will appear across the bottom of the screen. The Hint button shows the area a reader can touch (in dotted line) and the type of gesture to activate the functionality of the hotspot (the arrow suggests a drag gesture). The Hint button is a unique design of *H and B* that we would like to highlight, as most picture book apps, and apps designed for young children in general, tend to assume that children possess a complete gesture ‘grammar’ that they can apply to touch devices. Literature in multigesture design has shown that gesture learning is often required before a user can engage with the system (Kammer *et al.*, 2010). Simply, if a child only has a limited repertoire of multitouch gestures, they will not be able to fully explore the interactive and meaning-making potentials of apps. The second common function of extra-text touch interactive is to facilitate the ‘resemiotisation’ (Iedema, 2003) of the shared picture book reading practices, a notion we have discussed in the previous section. In Figure 7.2, for instance, when a user taps on the speaker button, a voice will read the text out loud, and when he/she taps on the flipped-page corner hotspot, a page-flipping effect will occur, landing them on the next screen frame.

Intra-text touch *interactives* in picture book apps are often designed using (existing) visual narrative elements, most typically the characters, the background of a page, and various inanimate objects. Figure 7.2b is an example of using the character as a hotspot. When the user drags the little girl towards the top of the screen, she gradually turns into a grown-up and a bottle appears around her neck.

a) Extra-text interactivity (left) and intra-text interactivity and ambience (right)



b) Intra-text interactivity and three types of meaning

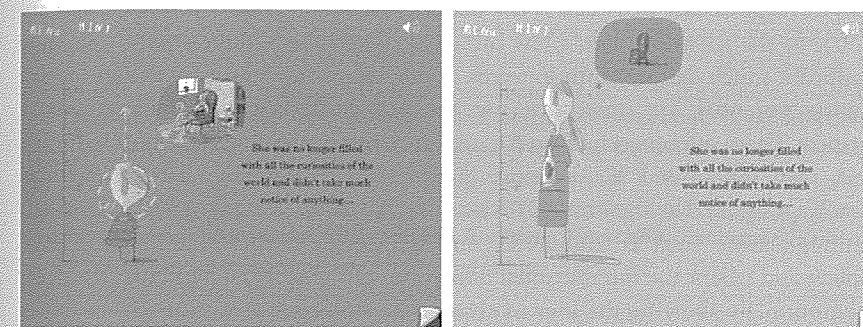


FIGURE 7.2 Examples of touch design in *The Heart and the Bottle*

Meanwhile, the image in the thought bubble changes from a happy memory of the grandfather to an empty chair. An example of using the background as a hotspot can be found in Figure 7.2a. The whole screen here is a hotspot. If the user performs a swipe gesture across the screen, the Ambience of the image turns gradually from a vibrant warm tone into a muted cold one. Touch designs can also use inanimate objects as hotspots. In *H and B*, the user can frequently interact with the heart and the bottle—the two main symbols of the narrative—and carry out actions that are performed in the story by the girl, such as shaking, hammering, and sawing the bottle.

Meaning-making with touch interactives

When a user interacts with an intra-text interactive design through the physical act of gesturing, he/she also performs an act of meaning-making in the context of the narrative. The touch design in Figure 7.2a, for instance, is a case in which intra-text

interactivity activates the interpersonal meaning, that is, 'wiping' colours off the screen in fact signifies the emotional change brought about by the death of the grandfather. In Figure 7.2b, the dragging gesture of the reader facilitates the progression of the narrative. It creates changes to the physical appearance and the inner thoughts of the character (Ideational meaning), marks a shift in mood (Interpersonal meaning), and signals the transition of temporal phases in the narrative (Textual meaning). In the two examples given here, the interactive designs are central to the narrative. Nonetheless, we have observed that many intra-text touch designs in picture book apps are peripheral to the story. One typical example of peripheral interactivity is one in which the user can tap (or tickle) a character and the character will make a sound (e.g., a giggle) or perform an action (e.g., jump). Yet the sound or the action has no relevance to the story, except that it allows the children to 'interact' with the character.

As intra-text touch *interactives* need to be interpreted in the context of the narrative, their designs tend to be unique to each individual picture book app. Our analysis suggests that in *H and B* the majority of the intra-text touch designs are central to the narrative, with a few instances of peripheral interactivity. The most significant touch designs, both in terms of frequency of occurrence and meaning-making potential, are those that use the girl, heart/bottle or background as hotspots. These *interactives* fulfil two main functions in the app version of the story. First, they foreground the narrative perspective of the girl, since readers are literally positioned as the little girl when they perform, via a series of multitouch gestures, actions such as hammering and sawing the bottle. Second, they make explicit and salient the interpersonal dimension of the story, in particular the shifts in emotion, by allowing the user to change the ambience at various points of the story using the swiping gesture. The app version therefore is not simply a multimedia or interactive version of the print. Rather, it constitutes an interpretative possibility (Unsworth, 2014a) of the story, a version of interpretation that creates 'amplified empathy' (Unsworth, 2014b) by aligning us with the emotional life of the little girl.

Implications and recommendations

In this chapter, we argued and demonstrated that interactivity is not simply a function of technology, but also a resource for meaning-making. We hope the following two implications drawn from our analysis will be useful for educators and caregivers exploring picture book apps with children.

Picture book apps can be considered as a version of interpretation of the book. The process of 'touching' and 'interacting' with various elements in the app is, in a sense, a process of textual interpretation, and could potentially be used for teaching children to make sense of the text, the image and the interactions between the two.

Interactivity is not inherently 'better' or 'distracting'. In choosing book apps for children, it is useful to understand and recognise those that facilitate shared-reading

practices, and contain interactive functions that are central to the narrative. With this understanding, adults can draw attention to the interactive elements that are central and discuss and scaffold their meaning-making potential during the shared reading.

Notes

1. The original book series uses a simple story pattern. The main character, the pigeon, bargains for an unreasonable demand he has made, such as to drive the bus or to stay up late, which is then being rejected by someone who is not visually represented in the book. Throughout the book, the pigeon constantly makes utterance such as 'No?', 'No?!' 'What do you say?', which implies the reader is the 'rejecter' here.
2. A similar feature is also present in the iBook app.
3. In this app, the children are presented with three versions of the pigeon story, referred to as the Egg, the Chick, and Big Pigeon. The Egg contains a story with identical structure to other books in the series, which involves the pigeon demanding to run the app. In the Chick, the children are first asked to make choices from a series of visually represented items on the screen, such as their favourite food, numbers, or stinky things. The choices the children make will then become key elements in the story, e.g. the request the pigeon makes. The Big Pigeon is similar to the Chick, except that the children are no longer being presented with visual choices of story elements. Rather, they have to come up with their own items, and then tap a red button to record them.
4. For the linguistic terminology used in this section please refer to: genre and meta-functions (interpersonal, ideational, and textual) (Martin and Rose, 2008), visual/verbal participants and processes (Kress and van Leeuwen, 1996/2006), ambience (Painter *et al.*, 2012), and appraisal (affect) (Martin and White, 2003).

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