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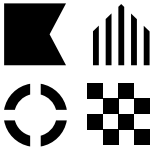
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A Preliminary Study of Interactivity on Visual Narrative in Children's Story Apps

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[Narrativa e Teoria / Narratives & Theory]

Keywords

Children's book;
interactive storytelling;
ebook; electronic
picturebook.

Abstract

This study discusses how visual narrative in children's electronic books can benefit from research findings on children's literature. In this paper we discuss the concept of interactivity in the context of ebooks as a resource that adds multimodal stimulus to visual narratives. Based on the work from Nikolajeva and Scott, we focus on three aspects to guide the design of interactive digital narratives for children: (1) ambiance, (2) representation of the characters and (3) the perspective of the narrative. The discussion is exemplified through the analysis of highly interactive children's ebooks, such as story apps. The results of this investigation aim at providing professionals with some preliminary guidelines that can helping them to design interactive books for children.

1. Introduction

Picturebooks stand out as a successful approach for engaging young readers that have little experience in reading [8] since the narrative is presented through images, usually illustrations. In fact, images do not require any interpretation competence, allowing and encouraging even younger children to *read the images* [17]. Therefore, the picturebook is a particular "format of expression" [8] that promotes the development of children's verbal literacy, stimulating the acquisition of aesthetic and cultural notions through different understandings of the graphic narrative [15].

In this context, it is important to understand that the picturebook is the main editorial product for children [8] and it brings together images, text and different forms of narrative. The illustrations play a fundamental role as they articulate aspects that cannot be easily communicated through words [6, 8, 15, 17]. According to Salisbury and Styles [17] the picturebook emerged out of the combination of literary texts and the visual arts resulting into a specific artifact for children. As such, the picturebook has an important role as an object of narrative and representational graphic art for children. Moreover, and given the enormous semiotic and semantic potential of picture books, reading the words and looking at the pictures in a picture book promotes the development of various skills [6].

Even though the traditional paper picturebook already presents a complex and rich narrative created by the interrelationship between

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text and images, the digital book (e-book) extends the potential of the printed picture book, by including multimedia resources [21]. Some highly interactive formats of digital picturebooks incorporate rich multimedia features, such as sounds or virtual reality (often present in video games) to intensify the reader's sensory experience. Some examples of such ebooks are story applications (Apps), which include multimedia interactivity elements into traditional narrative models.

The emergence of the touch screen and the mobility created by the iPad (2010) was a turning point in the history of the book, which greatly impacted the editorial book sector, resulting in the creation of a new type of narrative in the electronic format that combines the picturebook with technology [4, 5, 23]. Unlike the early generations of children's ebooks - which consisted essentially in scans of printed books - story apps are software applications specifically designed to take advantage of multimedia and interaction features available in modern electronic devices such as tablets and smartphones [19].

However, despite the growing number of available ebooks "there is relatively little critique in the reviewing community" [23:585]. While, story apps provide the opportunity for including meaningful interactions that promote the user's engagement with the plot in ways that printed books do not allow, the role of interactive features has not yet been fully explored [22]. Moreover, as Sargeant [19] points out, the experts themselves recognize the lack of standards to produce children's electronic books, since there are no guidelines for the design of interactivity. This is understood as a problem that may be faced by illustrators, editors and other professionals working in the field of children's interactive ebooks.

2. Interactivity Beyond Visual Narrative in Electronic Picturebooks

Printed children's books already afford different types of *physical interaction and intellectual interaction* [22]. Physical interaction can be provided at different levels such as page manipulation, pop-ups or other additional mechanical structures. Intellectual interaction serves to guide the reader through a nonlinear plot and to explore the content of the book, fostering the reader to solve story puzzles or to make decisions in order to understand the story. Children's book apps provide *digital interaction* that offers opportunities to interact with the story content and visual elements of the narrative in a way that is still unexplored.

The interaction areas in children's ebooks provide access to multimedia content, favouring multimodality [13]. According to Mayer's Interactive Multimodal Environments [11], such environments can be defined as environments that include two or more modes of representation that combine verbal and non-verbal representations, which target different channels.

In an extensive literature review on digital ebooks' for children, Menegazzi [12] found out that the interaction areas are linked to at least three stimuli modalities: visual, sonorous and tactile. That is, interactivity in most children's ebooks extends beyond the visual narrative, including animations, music, sound effects and locution. However, in order to

trigger the multimedia elements of the application, the reader needs to perform certain gestures and touch codes on the graphical interfaces of the display, as illustrated below (Fig. 1).

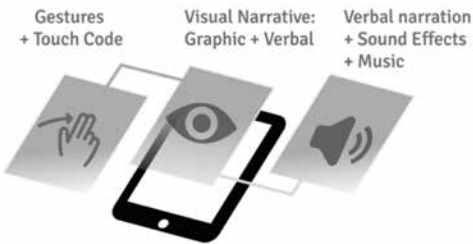


Fig. 1. Diagram of multimodality of ebooks based on Menegazzi [12].

In electronic picturebooks the visual narrative can be reinforced through the use of sound, generating auditory images that target the visual-auditory channels [2]. For example, a narrative using sounds such as knocking on a door, birds whistling, or an engine running are processed by the auditory and the visual/pictorial channel. Such nonverbal coding enriches the narrative and helps to convey scenes and meaning like images do [2].

According to Mayer's Cognitive Theory of Multimedia Learning [9, 10] by addressing different channels (visual, auditory and sensorial) through images and sounds reduces the readers' cognitive load, allowing them to better process the information. However, the design of such interactions needs to be well balanced combining visual, sensory and auditory stimuli in a coherent way, avoiding redundancy and an overload of stimuli that may distract the readers instead of engaging them. According to Mayer [9, 10], the mere inclusion of simple interaction commands such as forward, pause, and back may assist the learner in processing multimedia information.

Salmon [18] argues that "multimedia and interactive features that motivate and engage young readers are influential factors that can potentially influence reading frequency." Although interactive and multimedia content certainly have this potential, interactivity should be designed in order to enhance the narrative experience rather than disrupting the story flow or distracting the reader [2, 14]. When the interactivity is used inconsistently without a visible connection with the narrative [2, 14] children may fail to understand the story. On the other hand, ebook that provide well-designed interactions that are congruent with the literary content and with the reading task tend to be more attractive and effective promoting children's literacy [3].

The great part of research on children's ebooks claims that the inclusion of any interactive feature needs to be in accordance with the narrative and promote the understanding of the narrative [12]. However, the inclusion and role of interactive features has not yet been completely investigated [2, 20]. In the following we present our research findings regarding the integration and design of interactivity in ebooks for children outgoing from the work of Nikolajeva and Scott' work [15].

3. Literary Theory as a Guide to Design Interactive Visual Narrative

According to Nikolajeva and Scott' [15] the literary structure of the picturebook is composed of three main constituents: (1) ambiance; (2) characterization of the characters; and (3) narrative perspective. Outgoing from these elements we discuss how these properties can be useful to guide the inclu-

sion of interactivity in children's ebooks. For this, we will exemplify our approach with two ebooks for children, namely the *Goldilocks and Little Bear* [16] and *Lil 'Red - An Interactive Story* [1]. These two ebooks were selected due to their highly interactive visual narratives. *Goldilocks and Little Bear* (produced by Nosy Crow) received a special mention in the Fiction Book Category at the Bologna Ragazzi Award (2016); *Lil 'Red - An Interactive Story* (2012), was selected based on the readers' evaluation on the App Store. Conveniently both ebooks are adaptation of well-known fairy tales.

3.1. Literary Ambiance

The ambiance in children's picturebooks defines the situation and the story universe, where the story events occur, conveying the time and place where the narrative unfolds. The ambiance includes the scenarios, providing an *affective* atmosphere that influences the reader emotionally. Depending on the literary genre and whether it is a fairy tale or a horror story the ambiance can have different elements. The ambiance also represents the setup or environment where the characters are created and presented and in some cases it becomes personified, assuming the role of the narrator. Changes in the literary ambiance in the different pages of the books are very important as they serve as an indication to show the evolution and unfolding of the story. Such evolution can be done by changing the scenery, using chronological variations, changes in the tone of the narrative or in the stylistic character of the literary works [15].

The *Goldilocks and Little Bear* app [16] provides a good example of interaction targeting the visual ambiance. The application prompts the reader to guide the two main characters - *Goldilocks* and the *Little Bear* - through the different story scenarios, simultaneously allowing the reader to discover other elements in the scene and even to interact with the elements of the scenario. Figure 2 illustrates the moment when *Goldilocks* arrives at the home of the three bears. The reader can move the character within the scene by dragging it for instance to sit on the armchairs of the bears. By controlling the main character the reader can explore, discover and interact with the literary scene in his own way while enjoying the visual narrative. The progression of the story between the different narrative spaces, for example, the forest and the house of the bears, prompts the reader to touch an arrow icon in the lower right corner of the screen, this action triggers a marked transition between the virtual *pages*, which reinforces the change of space and narrative moment.



In the *Lil 'Red* app [1] the multimodal interactivity is also very well aligned with the narrative ambiance. Here, it is possible to interact with practically all graphic elements of the scene in a synesthetic way. For example, when the reader touches the tree-tops an animation of the leaves swaying and a rustling noise is

Fig. 2. A scene of the interactive ambiance in *Goldilocks and Little Bear* app [16].

triggered. It is also possible to interact with the birds and the frogs, to hit the trunk of the trees and hear the sound of the wood “toc toc”. The interaction with the elements of the scene allows the user to interfere in the story course. An example of this is the scene in which the user can touch the pine cones of a tree, which fall down awakening the Wolf (Fig.3). The

Fig. 3. Example of the interaction in the visual narrative in *Lil’ Red - An Interactive Story* [1].



clash of drum cymbals increases the effect, creating a funny moment

As Nikolajeva and Scott [15] explain, the literary ambience in children’s picturebooks, unlike the classic novels that emphasize the text, is also created through the visual narrative of images /illustrations. While words can at most describe space, illustrations can effectively show it. While the verbal text can help the reader to “see” the ambience and the scenarios, the visual representation of the scenes gives the reader more freedom for interpreting them [15]. As previously referred, the interactivity supported by story apps offers the readers a synesthetic setting, allowing them to play, to listen to sounds in the different scenes and even to actively interfere in the narrative by controlling the structures of the scene or the story character’s. Thus, it is important to keep in mind, as it also happens with printed books, that ambiences have the power to highlight and expand situations in the story, but they can also bring redundancy to the verbal narrative [15]. This needs to be taken into account when designing interactive ebooks, in order to further expand the narrative experience, increasing the readers’ engagement while avoiding unnecessary interactions.

3.2. Characters Representation

The construction of the characters in picture books occurs especially through images, whereas in other literary genres it usually occurs through verbal descriptions. The illustrations of the characters allow even to convey their physical characterization, without the need for a verbal description. Additionally, the illustrations may also serve to emphasize “inner”, emotional qualities of the characters, such as moods and feelings that reveal their personality and state of mind. Therefore, the richness of the characterization in picturebooks lies in the fact that this can be done by combining text and images, so that both instances can complement or contradict each other to create different effects and stylistic features in the embodiment of the plot [15].

The “*Lil’ Red*” app [1] allows the user to interact with the characters in an interesting way, as for instance, when the reader touches a story character, the application plays sounds and animations that reveal certain

characteristics of the characters' personality. For instance, when the user interacts with the Little Red Riding Hood character, it reacts with a childish laughter, whereas when the reader interacts with the Wolf, it shows his teeth, triggering a threatening sound.

The *Goldilocks and Little Bear* application [16] allows interaction with the characters through virtual reality, similar to a player, the reader can control the characters in activities linked to the story. During the interaction the characters address the reader directly and in the automatic reading version the reader can hear their voices. Both, the voices and the interactive animations fit the characters well, reinforcing the idea that the Goldilocks character is a curious girl.

3.3. Narrative Perspective

The narrative perspective refers to the “point of view” of the narration, which can be assumed by the narrator, by the characters or by the implied reader. It can be a literal perspective, in accordance with the perspective of the events' presenter; figurative, when it conveys an ideological view of the world; or transferred, when the narrator appropriates the story and tells the events. In picturebooks, the narrative perspective is again related to the switching between the communication through pictures and words, between showing and telling [15].

According to Nikolajeva and Scott [15], the main differential of picturebooks are the ways in which text and image can jointly benefit the narrative adding its peculiar characteristics. While “only verbal texts can comment on events and characters or address the reader immediately (“Now I will tell you ...), [...] the images have their own means of expression” [15:157]. As for instance, when a character looks directly from the illustration to the reader, or instead it is presented using different modes and framing angles, being displayed for instance below the reader's line of sight, making the character seem fragile.

Highly interactive children's picturebooks, such as story apps, may allow interaction throughout the story to show different content or narrative perspectives. This is the case of the *Goldilocks and Little Bear* app that allows the reader to rotate the tablet device, revealing another story version. As in the “normal version” in the rotated version the Little Bear character also enters the humans' house and tastes their food (Fig. 4). The bear sits on the armchair and the reader can choose in which bed it will lie down. By physically interacting with the tablet, spinning it again, the reader returns to the original



Fig. 4. Different types of narrative perspectives in “Goldilocks and Little Bear” app. [16]

story version where Goldilocks is the one that invades the house of the Baer.

Multimodality associated with the story can contribute for creating more dynamic and engaging stories. The inclusion of sound and touch can enrich children's literary experience. As an example, the *Lil' Red* app [1] triggers bass sounds when the reader interacts with the Wolf, generating a sense of danger (Fig.5). However, when the reader interacts with the Little Red Riding Hood character, it emits sounds of laughter as well as subtle sound and animation effects that represent the little girl in the



Fig. 5. Perspectives of the visual narrative in *Lil' Red - An Interactive Story* [1].

story. These variation of the visual and the auditory stimuli that are triggered when the reader interacts with the story characters create empathy with the Lil' Red, generating feelings of fear towards the wolf. Therefore, the interaction can reinforce a particular aspect of the narrative.

In printed picturebooks children can benefit from the richness of the graphic forms and in interactive pop-up books they can additionally explore the books in a tangible, sensory way, this also allows them to read the story in a very personalized way. In story apps children are able

to control the characters and the elements of the scenario in a playful manner, similar to playing a game. Such affordances can promote a deeper involvement with the story. However, to achieve this, the application need to be carefully designed, since the inclusion of the interaction can also have a disturbing effect [2] impairing the reading activity. Therefore, when designing the interaction for ebooks, developers and designers need to focus primarily on the story and carefully consider the types of interaction that they may use. Such approach will allow the readers to focus on the literary activity, enabling them not only to read, but also to play an active role in the construction of the narratives.

5. Considerations

Through the illustrated book the child comes into contact with reading in several ways, since the interaction with the text includes diegetic and mimetic characteristics, the images and visuals facilitate the representation of the ambience and the characters, enriching the storytelling activity. A well-balanced approach between the story plot and the design of the interaction in ebooks for children needs to consider these characteristics and the literary qualities into account.

As children's books increasingly move into the digital format, the connections between interactivity and literature also grow closer together. "As books incorporate higher levels of interactivity, the reader, in turn, is likely to become more active" [19: 2]. If the design of interactivity in children's ebooks is geared towards promoting a good reading experience and the understanding of literary contents in a more dynamic and immersive way, this can stimu-

late higher levels of engagement and reading comprehension [2, 7, 20].

Story books in the form of ebooks have the potential to increase the visual narrative by including digital and multimedia interactivity. Interactivity can have impactful effects on reading and when it is well aligned with the story plot, it can lead to even greater proximity of the readers by enabling them to participate more actively in the development of the story plot. Interactive features that are congruent with the narrative can contribute to increase the reader's engagement with the story. This opens avenues for integrating interaction in ebooks as a resource that allows children to actively participate in the construction of the story, telling it in their own way, having access to different perspectives of the narrative and the presence of multimedia effects that enrich the characterization of the characters making the visual narrative even more synesthetic.

6. Future Work

This paper is part of a research project about the design of interactive features for children's ebooks. We presented a theoretical discussion and proposed possible solutions to help designing better interaction in children's story applications. In future work we intend to further investigate these issues and to present a set of guidelines for the design of interactive children's books.

Acknowledgements

The present work was carried out with the support of CNPq, National Council of Scientific and Technological Development - Brazil. Process number: 206788/2017-7. The first author is a fellow of CNPq - Brazil. The second author acknowledges the support of the Portuguese Foundation for Science and Technology - FCT- within the grant: SFRH/BPD/111891/2015.

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