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On-screen children's stories: The good, the bad and the ugly

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CHAPTER 6

GENERAL DISCUSSION

Storybook apps are recommended for parents and educators.¹ However, there is no agreement on which apps should be recommended. On the one hand, interactive apps are praised. On the list ‘Best Book Apps for Kids’² of Common Sense Media, a nonprofit organization in the United States, all the narrative English language story apps are highly interactive, while only about half of them include multimedia features. On the list of ‘The 5 Nicest Apps for Young Children’³ published by Mijn Kind Online, the apps *Pim en Pom* by Fiep Amsterdam B.V. and *Bobbi naar de Dierentuin* by Kluitman are included. The *Pim en Pom* app features some automatic animations that are not related to the story. The app *Bobbi naar de Dierentuin* includes both a non-interactive multimedia and a print storybook version of the story. In the multimedia version the story can be interrupted by clicking on the icons for games in the menu. It is notable that in some lists electronic stories that are most similar to traditional print storybooks are promoted. ‘The Best Free Apps for Children’ list⁴ of Kennisnet includes three story apps for kindergarten-aged children without animation or interactive features.

Award-winning apps are also interactive, often including irrelevant elements during the story. For example, the app *Noa’s Sterren* by Hanneke van der Meer offers visual and sound effects as hotspots that are not related to the story (Media Ukkie Award 2014), the English-spoken *Little Red Riding Hood* app by Nosy Crow features small games in every scene like collecting visual elements in the basket of Little Red Riding Hood (The Best Book Awards 2014 in the category ‘Best Tech Stuff’), or the app *Cinderella* by Nosy Crow includes little games like choosing Cinderella’s dress or the music at the ball (FutureBook Innovation Award 2013 in the category ‘Best Children’s Digital Book’). On the other hand, a report from the Joan Ganz Cooney Center warns against the detrimental effects of enhanced, highly interactive storybook apps for parent-child co-reading and children’s story comprehension, and promotes “basic” electronic books with fewer extra features (Chiong, Ree, Takeuchi, & Erickson, 2012).

PROS AND CONS OF TECHNOLOGY-ENHANCED STORIES

Interactive features are more widespread than multimedia elements in today’s story apps (Guernsey et al., 2012). Some interactive storybook apps use the original artistic illustrations of famous storybooks in addition to nicely designed interactive features that can be appealing even for adults like in the apps *De Geweldig Vliegende Boeken van Meneer Morris Lessmore* by Moonbot Studios LA or the *Alice for the iPad* app by Atomic Antelope. These apps give the impression that they are high-quality books and optimal learning materials for young children. It is not surprising that parents and educators select those for educational purposes.

The results of the present thesis provide empirical evidence for the learning benefits of multimedia stories but they do not support the current trend of highly interactive electronic stories. Chapter 2 reviewed the literature on research with electronic stories as compared to print storybooks and found distinct patterns in the results. Studies with electronic books including multimedia and interactive features that are not tightly connected to the story showed negative results. On the other hand, digital stories with congruent multimedia and interactive features (e.g., dictionary function or questions and feedback provided by a computer tutor) were found promising. This differential pattern was explained by young children’s limited cognitive control and inability to multitask, which is required in the case of incongruent features.

From a quantitative synthesis of the currently available empirical evidence in Chapter 3 it appeared that the technological transformation of stories can be beneficial. Similar to Chapter 2, multimedia stories were found to facilitate children’s story comprehension and word learning more than print storybooks. Multimedia elements were even found to have comparable benefits as support from an adult while reading print storybooks for children’s cognitive development. This appeared from a meta-analysis reported in Chapter 4. However, multimedia stories cannot replace the benefits of parent-child shared reading activities on children’s social-emotional development.

Outcomes for interactive stories differed. Interestingly, even features that were relevant for the story were not found helpful. In fact, interactive features seemed to decrease the benefits of multimedia additions on story comprehension and expressive vocabulary. Results were especially articulated for groups of children who are growing up in disadvantaged and less stimulating environments and might lag behind in language development.

The benefits of animations for children’s comprehension was further confirmed in an experiment reported in Chapter 5. It was found that children’s attention is more focused on the moving details when looking at animated illustrations as compared

¹ <http://www.pbs.org/parents/childrenandmedia/article-how-to-choose-iphone-apps-for-kids.html>

² <https://www.common Sense Media.org/lists/best-book-apps-for-kids>

³ <http://mijnkindonline.nl/artikelen/de-5-leukste-apps-voor-jonge-kinderen>

⁴ http://www.kennisnet.nl/fileadmin/contentelementen/kennisnet/Dossier_mediawijsheid/Publicaties/Brochure_de_beste_gratis_apps_voor_kinderen.pdf

to static pictures. Thus, the mechanism for the advantage of animated illustrations seems to be due, at least partially, to the capability of motion to guide children's attention to details of the illustrations that depict the narration. When animation in pictures attracts attention to details that provide a more precise and timely depiction of abstract language children understood the story better.

GUIDELINES FOR OPTIMAL ELECTRONIC STORIES

Based on the empirical evidence that is available at this point and on the results of the present thesis the following guidelines are proposed for designers of children's electronic stories and for parents and educators selecting optimal learning materials.

1. Animated illustrations and the inclusion of sound and music effects to illustrate the story are encouraged. Such automatic multimedia additions were found very beneficial, especially for children who lag behind in language development. Multimedia elements should be congruent with the story both in terms of the content and in time, that is, they should illustrate the text of the story at the same time as it is read aloud. These parameters make the multimedia additions optimal for learning. Additionally, enabling options to turn off some of the multimedia features like the background music (e.g., in the app of *De Geweldige Vliegende Boeken van Meneer Morris Lessmore*) might cater for special groups of children such as the ones experiencing problems with perception of speech (Smeets, van Dijken, & Bus, 2014).
2. Multimedia seems to have the same effect as adult support during book reading. It seems to guide children's attention while looking at illustrations just as an adult does by pointing and commenting during shared reading.
3. More specifically, animated details in illustrations seem to be a powerful tool to direct children's attention to different parts of the illustration. They can be designed to guide children to select the visual details that help to understand the story text, as was done in Chapter 5. However, incidental or decorative movements in the illustrations are predicted to interfere with story comprehension.
4. Interactive features such as hotspots and games, as appealing as they might be, should be limited. Such elements were found to overwhelm children and have detrimental effects for children's story comprehension and word learning. With an abundance of interactive features children are likely to ignore the narration and only play with the hotspots and games (de Jong & Bus, 2002). The option to "turn the pages" might allow children control over the pace of the story, however, most likely it enables them to rush through the story looking for games and hotspots.

5. In Chapter 3 even the interactive features that are related to the story or language skills like a dictionary were found unhelpful. It is therefore advised against the inclusion of 'educational' interactive features. Young children do not have sufficient inhibitory and attention control to keep switching between interaction with such features while listening to a story. It is worth noting that when small animations and sound effects illustrating the story are available in the form of hotspots, in contrast to automatic multimedia features, they mostly do not appear at the same time as the oral narration. This probably renders them less optimal for dual coding and fostering comprehension.
6. Instead of disturbing the story line, hotspots and games might be better offered after children listened to the story. For example, some interactive storybook apps like the app *Pinokkio* by Chocolapps SAS include different modes including an "autoplay" option that plays the story automatically without enabling interactive features. It is plausible that the extraneous material of hotspots and games that are relevant to the story provides helpful additional learning opportunities if they are not presented simultaneous to the story. However, there is a serious risk that children never choose the Read a story option and always prefer the play mode (e.g., de Jong & Bus, 2002).
7. Since research on the effects of a digital tutor providing questions and feedback in electronic storybooks is scarce it was only superficially discussed in the present thesis. However, results are promising and it seems that a tutor, instead of being a distraction, might make children more attentive just like an adult during shared book reading (Plak, Kegel, & Bus, 2015).

CONCLUSIONS

In sum, interactive features such as hotspots and games, although making apps attractive, were not found to be beneficial for young children's story comprehension. In fact, they require children to keep switching between the story and the interactive element and, as a result of that, they interfere with story understanding and language learning. The results of the present thesis do not support the educational value of the current trend of highly interactive storybook apps. Interactivity might be helpful in the case of educational games like alphabet games (Kegel, van der Kooy-Hofland, & Bus, 2009; Kegel & Bus, 2012) but listening to a story requires a lot of cognitive effort from young children and any additional activity seems to distract them.

Multimedia features like animation, zooming, music and sound effects closely illustrating the story, in contrast, were shown to facilitate children's understanding of the story probably by depicting and concretizing the abstract language and directing

children's attention to key details in the illustrations. Such nonverbal information was found to be especially helpful for children who are experiencing problems understanding the story line and language due to a language delay. Multimedia additions seem to support the creation of well-integrated, deep and meaningful mental representations.

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