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Evaluation of Interactive Children Book Design The Case Study of „Little Rooster”

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Abstract. In spite of mushrooming of interactive books apps for kids, there is hardly any evidence on “what makes a good interactive book”. In this article we provide an in-depth analysis of design issues, and give account of the exploratory evaluation of experience with “Little Rooster”, an interactive book designed and implemented at our Lab, first of all for research purposes. We let 7-8 year old kids to “read” the interactive book, and/or a printed, traditional version with the same content. On the basis of analysis of the video recordings of the reading sessions and the interviews, we list our observations on what children found of the visual and sound design, how they used (or not) the interaction facilities for control and what strategy they followed in mixing reading and interacting. We also investigated the effect of the moving, interactive images on understanding and remembering the narrative of the story, and on understanding concepts nowadays usually unfamiliar to children living in a town. We finish the article with discussing experimental methodological issues and summing up design considerations.

1 Introduction

In course of the TERENCE EU7 project [9] we got aware of the rich potentials of the tablet as new medium for delivering reading (and other educational) materials. We started to critically look at existing apps [1] and explore the possibilities by making interactive books [4] in the Creative Technology Lab of MOME [2]. We immediately noticed that the market is running ahead of the sporadic research [4, 6-8]: though the educative apps, among them interactive books are mushrooming, there are hardly any approved design principles, or empirical research on the effect of design decisions. This is no wonder, as the medium offers a richness of possibilities never seen before for creating interactive experiences.

In this article we focus on interactive books for kids (further: IB), designed for tablets. By the term we mean textual reading material which is enhanced with interaction facilities, to “bring to life” the illustrations (which may be additions to some illusion of aliveness). Besides the moving images, features like sound effects, music, text loud

reading or even interactive typo or the inclusion of user-created content (drawing, photo, own voice recording) may enhance the “reading” experience. Next to (or fully interwoven with) the story, games and puzzles may also be offered, for fun, or to help to understand the text or test what was read or to improve skills.

In this article we give a report on the in-depth evaluation of how 7-8 year old kids used and experienced “Little Rooster”. This IB was designed and implemented at our Lab with the intention to use it as a “medical horse” to research how children react to phenomena they do not encounter in traditional books.

In section 2 we introduce the story and the design of “Little Rooster”, and the experimental setting in which it was tested. In section 3 we discuss some important results of the evaluation of usage, design, subjective experience and effect on text comprehension. We finish the article with summing up major conclusions and discussing experimental methodological issues, as well as outlining further work.

2 The research materials and setting

2.1 The Design of “Little Rooster”

We prepared for 6-8 year old kids an interactive version of a well-known Hungarian folk tale. It is about Little Rooster who finds a diamond halfpenny which is confiscated by the Sultan, but finally taken back by the cunning bird. The story develops in 4 scenes, in each the Sultan is trying to torture Little Rooster to stop him from demanding back her halfpenny. But every time Little Rooster outwits the Sultan, and finally gets not only his halfpenny back, but takes all the treasures of the Sultan. In each of the scenes there is some characteristic movement, and objects from peasant house-holds (a well, a bread-baking oven and a bee-hive) play an important role. The text is relatively short and balanced. There are three major conflicts, each involving 2 symmetrical situations, and each conflict is solved by the Little Rooster repeating some similar spells, till the danger is over (sip up all the water, suck up all the bees, let out all the water, let out all the bees).

After having looked at the visual and interaction design of dozens of interactive book titles from the app stores, we decided to create of our own IB, with the following goals:

(1) The illustrations should be of outstanding quality, original in appearance, and different of the „ruling” vector graphics style.

(2) If the depicted phenomena (like fire, or bees, or the hub of a wheel of a well) have sound, the moving images should be enhanced with the proper sound effect.

(3) The majority of the „interactives” should underpin the story, its narrative – by letting the child to re-enact the major elements in the narrative. (We will refer to these as narrative interactives, N.)

(4) For experimental purposes, we include a few interactives which enrich the scenery. (We will refer to these as enrichment interactives, E.)

(5) Beside touch gestures, shake is also to be considered as input modality.

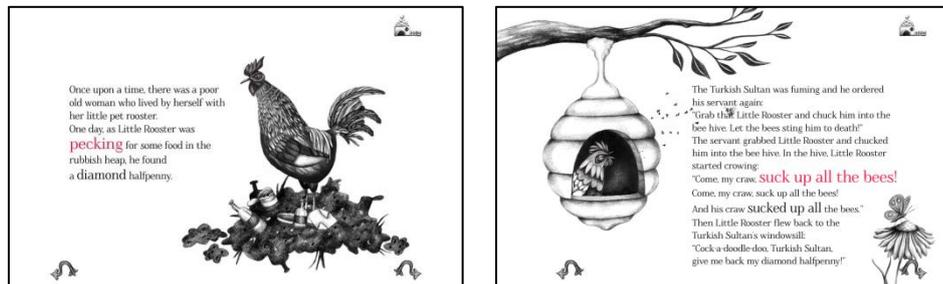
(6) The interactions should be designed logical enough that the child can discover them easily, without any visual or textual help.

(7) We use all aspects of the design to support the text comprehension of the child, relying on narrative principles. [5]

The illustrations were made by a graphic artist specialised in children's book illustrations. We consulted with experts in graphic design, in book typography, but also with a professor in pedagogy specialised in education of young children. The illustrations were drawn by hand, with pencil on paper. They turned out to be so rich in texture that, after some preliminary tests (by kids, as well as by graphic designers and educators) with colourings, we dropped the initial idea of colouring the illustrations, and used them in monochrome version, underlining the archaic style.

For the textual part, we used Foglihten sheriff font (pt 26) which is clean and easy to read on tablets by early readers. For each page the text was carefully placed with respect to the illustration. We enhanced the simple text with some words in red (42 point) or in bold (35 point). These features not only made the text attractive, but helped to grasp the essence of the scene (in bold), and to get the action the reader was supposed to animate in the drawings (in red).

A separate page was devoted for each scene in the story (see Figure 1). What could be "brought to life" by interaction in the illustrations, was slightly moving with natural-looking idle movement, attracting the attention. Usually, there was one N per page, corresponding to the major event told in the story on that page. For each page, navigation arrows were placed in the bottom corners, plus an icon to re-start the story.



• Fig. 1. Two screenshots from "Little Rooster".

Special is the scene where the rooster, if tapped, sips up the water in the well. Then the reader may pull him out of the well by turning the wheel and lifting the bucket. This second interaction extended the text, where there was nothing said about how the rooster got out of the well. This second interaction was conditional, could be performed only after the first act was accomplished.

For events which have sound in nature, sound effects were added, and emotional outburst (e.g. by the Sultan when stung by bees) were used.

The programming was done in Flash. The IB is available for free both for Android and iOS devices, in English and Hungarian. [3]

For comparison, we also created a printed booklet-like version, where the most characteristic moment of the interactive illustration was shown.

2.2 The setting of the evaluation

We set out at performing an in-depth empirical analysis of usage, revealing details of interaction and providing ground for methodology for further, large-scale evaluations. We went to a local primary school in Budapest, and had sessions with 17 children, each from class 2 (just learnt to read), aged 7-8. Children were selected to represent a balanced group with respect to gender, reading skill (indicated by the teacher) and media exposure (assessed in a preliminary interview). Children had an interaction session one by one, alone, in a separate room used for after-school activities. The sessions were conducted by well prepared students (who emphasized that they were not the designer). The entire session was video recorded automatically, resulting in a 25-45 minutes video for each session.

The child was told that he/she would be contributing to testing a new kind of book designed for their age group. Then the child was briefed to assess reading habits, familiarity with the story (they were asked to tell the story which served as basis for comparison after the session), and media usage. Then the child followed one of the procedures, depending in which group he/she participated.

In **T (tablet) group**, she/he was introduced in 2 minutes to the touch gestures which appear in Little Rooster (tap, circular) and shaking, by manipulating a scene with a boat (made for the purpose). Then she/he was told to read the Little Rooster, play around with the images, in the way she/he likes, as long as she/he prefers. Then an interview was taken, with questions about usage and liking of the app, the illustrations, the sounds. The story had to be told by the child. The conductor asked to explain some objects or events which came to life by interaction. The latter questions were intended to get an idea about text comprehension.

In **P (print) group**, the child was given the printed flip-over booklet, and similar process was pursued as for T. Then, as a bonus, the child was shown the interactive version, with the same intro as in group T. After the child finished to play around with the IB, also the questions relevant to interaction design were asked. She/he was also asked about preference. Due to space limitations, in this article we use the P group as control group.

Each video recording was coded by 2 coders, independently. In case of discrepancy, the third author took a critical look and resolved the conflict. Besides the interviews, the usage of the app was also coded: for each interaction in each scene the numbers of successful and failed trials were counted, as well as time periods of reading only, interacting only, and both. The coders were also looking for emotional reactions (by face, in words, body).

3 Evaluation results

3.1 Interactions

Table 1 gives an overview of the interactions performed by each subject in group T. We sum up observations on **interaction types**, taking also into account additional data from the coding of the usage and interviews:

effect of interaction	code	number	T1	T2	T3	T4	T5	T6	T7	average
LR pecking	N1	5	4	3	3	5	1	5	2	3,29
LR jumps while running	N2.1	unlimited	1	1	2	2	1	0	0	1,00
S sits down while running	N2.2	unlimited	0	0	3	3	0	6	0	1,71
LR crowing	N3	unlimited	2	1	2	5	1	2	2	2,14
LR sipping up the water	N4.1	3	3	3	3	3	2	3	3	2,86
rescue LR by turning the wheel of the well	N4.2	1	0	2	1	2	0	2	2	1,29
bird singing	E1	unlimited	0	2	2	0	0	2	2	1,14
LR jumping away from servant	N5.1	unlimited	2	1	2	6	1	0	0	1,71
servant jumping up to catch LR in vane	N5.2	unlimited	0	0	0	5	4	7	3	2,71
weathervane turning	E2	unlimited	0	1	1	0	0	0	2	0,57
LR putting out the fire	N6	6	0	6	6	6	3	6	6	4,71
LR sipping up the bees	N7	4	1	4	4	4	4	4	4	3,57
single bee flying away from flower	E3	unlimited	0	1	3	3	5	0	2	2
S suffering from bees	N8	unlimited	0	1	3	7	4	9	1	3,57
LR sipping up coins	N9	3	3	3	3	3	3	3	3	3
waggle rocking chair	E4	unlimited	0	0	0	0	0	0	0	0
tablet in hand	--	---	Y	Y	Y	Y	Y	N	Y	6/7

Table 1. Types of interactions performed in group T. Data for E types are in grey rows.

(1) N interactions were preferred over E interactions, that is, children indeed were “replaying” the story.

(2) Children preferred more interactions which tortured the Sultan (S). This is particularly apparent where pairs of N interactions could be done in the same scene, one of them punishing the S (or his servant). Children clearly enjoyed the most the nearly sadistic interaction N8 (this was also expressed in the interviews).

(3) Children performed N interactions as many times as needed for completing the event mentioned in the narrative where the goal was clear (N4.1, N6, N7, N9). Interestingly, only less than half of the subjects completed the very first N interaction – finding the diamond halfpenny. This may have to do with the fact that pecking is not so attractive act, and had to be repeated 4 times before success. Unlike in the other cases, here no “partial result” could be seen after each tap.

(4) No child performed E4, though they usually held the tablet in hand. This was the only E interaction by “shake” gesture. Moreover, this was in the closing “happy end” scene of the story.

(5) The specific circular gesture (to turn the wheel of the well) was not properly by most the subjects. This interaction was not suggested by the story, but – just as all the other ones – indicated by slight idle movement. As the children were not familiar with how the depicted well works (this was evident from the interviews too), so the lack of real-life example prevented them from performing the right gesture.

(6) There were characteristic differences in subjects’ attitude. E.g. T1 was very reluctant to explore the images, while T6 was the most active. (Both subjects were familiar with tablets, T1 was girl, T6 was boy).

(7) Navigation was no problem for any of the subjects (not shown in the table).

As of **reading strategy**, here are some of our observations:

(1) All children did read the text, all but one fully, often even second time (in group P, or when repeating the page).

(2) Majority of the children read the text first, and then started to explore the illustrations. A couple of subjects were jumping between reading and interaction. Only 2 subjects out of the 17 started to explore the illustrations before reading.

We can say that neither the interactive content nor the sound effects distracted the subjects from the reading. This may have to do with the school setting, but may be also the positive effect of the typo with eye-catching features.

3.2 Design

As of the **illustrations**, we found:

(1) Children did not complain about the monochrome and archaic style. On direct question, only a few said that they would prefer to have some colour. Nobody mentioned “vector graphics style” as more preferred or appropriate on tablets.

(2) Children were very critical about details of the drawings. Several boys were asking for (yet) more realism in the “living” scenes.

(3) Children were pinpointing small discrepancies between story and the effect of interaction.

Children did notice the **special typography**. As of the function of the highlighted words, we can say:

(1) Highlighted words drew their attention, some kids tapped on them at first.

(2) In the interviews about a third of the subjects attributed to these highlighted words the “essence” of the story. Some discovered their “hint” role for interactions.

Feedback about the **sounds** was very sporadic. Here are the general conclusions:

(1) The permanent and dramatic “background sound” (in one scene the noise of continuous chasing and running) did disturb poor readers – this could be noticed in their reading behavior as well as what they told in the reflective interview.

(2) The sound of the natural phenomena (bees, fire, ...) did not occur to them. On the other hand, in recalling the story some kids did use the special sound of the rooster crawl. (Our questioning was not addressing the sound effects per se.)

3.3 Liking and text comprehension

We explored **liking** on the basis of questions in the interviews. Here are the major observations:

(1) Most of the subjects said they liked the interactive tale. They referred to the moving image, possibility to be involved in the story. Several children mentioned the joy of punishing the Sultan. “Funny” was a common term used to explain liking.

(2) Several children, especially boys said that this tale is too childish for them, so they would recommend it to younger children. (Actually the tale is told in kindergarten, and many children knew it from years before, though they forgot the events.) Boys also expressed that they would prefer to have more action, more excitement. There was a clear gender difference in liking the story, even in the IB form.

(3) All children were open for another similar experience.

(4) The (facial and bodily) behavior of most of the children did not reveal liking – they were “going through” the IB as a (school) task, with tense expression.

(5) All of the subjects in group P found the IB version more interesting, they would prefer to read a tale in this format.

We were the most interested in the effect of the IB on reading and **text comprehension**. Here we raise only the major observations based on pre- and post-test inter-views:

(1) For T6, a poor reader but experienced in media, this form of reading was clearly much more motivating than for the average. He got most excited, had the most comments on the realization. Besides doing the most interactions (as shown in Table 1), he was reading with interest.

(2) We found a correlation between how good reader a child is and how handy she/he is with the interactive media. This may be characteristic of the social conditions at the school, accommodating children of well to do and above average educated parents. Moreover, when looking at the effect of the IB in terms of text comprehension, we found that if the child was a good reader, or experienced with interactive media, he/she was good in recalling what he “read” in the IB. This is in line with the above observation.

(3) As of learning new concepts, the “village well”, depicted (only) in the interactive illustration, brought results contrary to our expectations. Not only children could not “operate” the well with the required circular gesture, due to lacking the example from real life, but those who had some idea about a (different) well got somehow confused that the well depicted was not like the one they knew of. Thus it seems that the knowledge gained from real life makes children richly interact with (realistic) moving illustrations. We cannot (and should not) expect too much in the other direction, at least in this genre and with this age group.

(4) The recall of the narrative of the story (number and order of events), as well as usage of special (archaic) terms in the text increased clearly in both the T and P groups, in comparison to how the story was recalled at the beginning of the session. There seemed to be a better performance in the T group.

4 Discussion

In this paper we gave a summary of the exploratory empirical testing of an interactive book by 7-8 year old children. Our most important messages are:

(1) Our age group was (still) open to non-commercial, artistic visual representation, and accepted well monochrome drawing on tablets. However, they were critical on content, especially if something did not match their own concept or was not fully in line with what was read in the text.

(2) Children “used” different interaction options according to their role in the narrative, and their own sympathy for the characters involved.

(3) The interactive medium can make reading appealing, even for poor readers.

The detailed comparison of the T and P groups will be done in another article. Based on the present study, we intend to refine our research setting and target group. We plan the following further investigations:

(1) Repeating the experiment with English target group, who are not familiar with the story, and have a different cultural background.

(2) Making similar investigations with pre-school children (text narrated).

(3) Repeating the experiment with children in a relaxed, home setting.

(4) Testing the “vocabulary forming” potential of interactive moving images with objects and events totally unknown to the target group.

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