

Arousing Elements in Children's Digital Interactive Storybook

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ABSTRACT

This paper reports an ongoing study on making children's digital storybook arousing. The problem being addressed in this paper is the lack of proper elements for guiding designers to incorporate into children's digital storybook. Without the proper elements, designers tend to design digital storybook based on their preferences, instead of those usable to the children. This may lead to discouraging state when children interact with the digital storybook. To address that, this paper aims at determining the most common interface components for digital interactive storybook that make children feel aroused when interacting with. In accomplishing that, a series of field study was carried out, involving a sample of interactive digital storybook. Data were collected from 13 children aged seven to nine through observation and interview. In the end, a set of most common elements that make children aroused when interacting with interactive digital storybook were gathered.

Keywords: Digital storybook, children, arousing.

I INTRODUCTION

The nature children grow in this digital age is very much exposed to technology (McKillop, 2005; Churchill, 2007). What arouses them is different than those arousing their parents' during childhood. This has to be realized to ensure the point of understanding meets between the parents and their kids in this arena (Tapscott, 1999; Salpeter, 2005). Further, the nature they grow shapes their experience and skills. Thus their activities are also shaped accordingly (Madej, 2003). Not only activities at home are developed, but also activities in gaining knowledge and information are developed through their way of grow. Hence, we could witness that schools have to adapt technologies into their pedagogy (Ariffin, 2009).

Nevertheless, the way they communicate is very much supported by technology. Telephones have been secondary, after the computers with the Internet (Druin, Bederson, Boltman, Miura, Knotts-Callahan, & Platt, 1999). The landscape is overloaded with various communication tools such as Facebook, blog, and twitter. This allows them to communicate with a wide locus of peers, without discarded by physical boundary (Mayhew, 1999; Preece, Rogers, & Sharp, 2007). This paper has no intention to discuss about the social network and its effect on the users; hence the

discussion is led to the state of the art of interactive digital storybook.

Children are much closed with imagination and stories (Lambert, 2002). In fact they could learn through storytelling (Meadows, 2003). In current advancement, interactive digital storybook could be enhanced with more than just text and pictures, as available in those the conventional ones. In fact, they could be made available online, pervasively, to be accessed at children's convenience.

When compared to the conventional interactive storybook, the digital versions are much better. As an illustration, while the conventional ones are not able to read for the children, the digital ones can narrate the contents for the users. Besides, there are many other advantages of digital storybook over the conventional ones as has been commonly understood (Ariffin, 2010).

When children are much closed with interactive digital storybook, designing the applications or products to suit their needs is necessary. It is important to ensure that the children are engaged with the contents. Besides, properly designed digital storybook will arouse the children while interacting with. However, traversing the literatures reveals that the guidelines for making arousing digital storybook are not formulated. This makes designers or teachers design based on their own preferences, which eventually make the digital storybook forces children to adapt their cognitive states (Ohler, 2004). As a consequent, children refuse to interact with interactive digital storybook (Schilit, Golovchinsky, & Price, 1998).

Based on the discussion in the previous paragraph, this study aims at determining the most common interface elements for interactive digital storybook that arouse children. This has been achieved by performing activities and tasks as detailed in the following section. Next, the findings of the study are outlined in Section III. Further, the findings are discussed with relation to the context of use in the subsequent section.

II METHOD

The most common interface elements for interactive digital storybook that arouse children were gathered through a series of field study. In the field study, 13 children aged between seven and nine were involved. It is sufficient enough for this study because the nature of study is very subjective (Schneiderman, 1998; Preece, Rogers, & Sharp, 2007). Besides, the characteristics of the children at that age are homogenous (Dix, Finlay, Abowd, & Beale, 2004). They were provided with a sample of six interactive digital storybooks (depicted in Figure 1). The content of the digital storybooks is similar, but the presentations are different. It was decided to be like so because the focus of study is on

the interaction, not the content. The children were observed while interacting with the storybook. On top of that, they were interviewed to gather richer data.

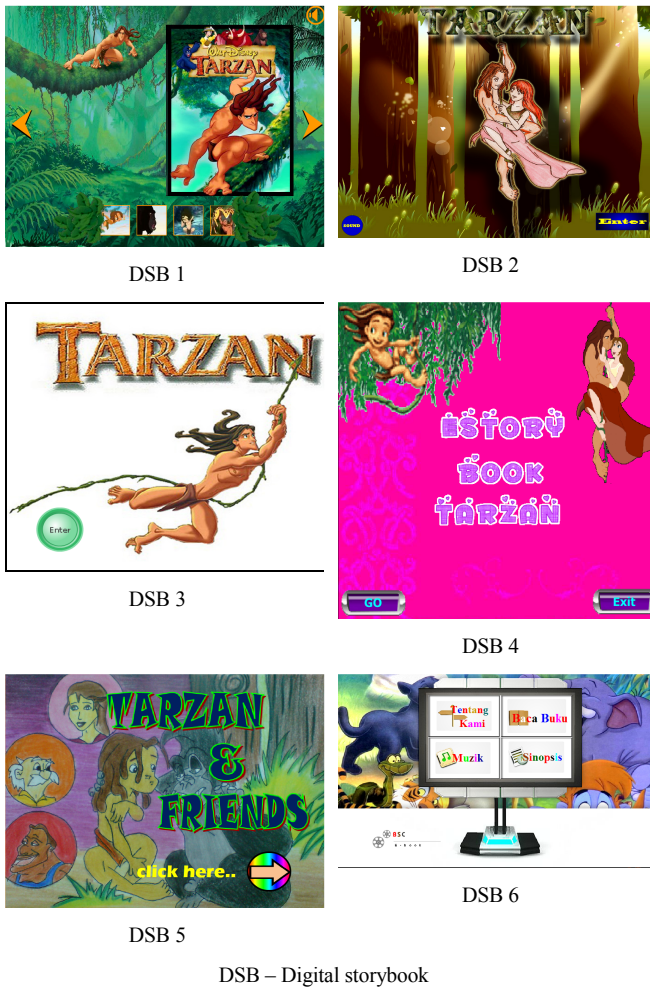


Figure 1. Front pages of the digital storybook

A. The procedure

This study employed children of a primary school in Kuala Lumpur. First, the management of the school was contacted to arrange for the field study session. The field study lasted in half-a-day, from 8.30a.m. to 12.30am. In the field study, the digital storybooks were played on different computers simultaneously. Every child was allowed to experience the storybooks on their own pace. The researcher observed the children while they interact with the digital storybooks. They were assisted by their teachers when necessary. While observing the session, this study noted meaningful data, which were witnessed through the children's body language and their interaction among themselves. After the session, the children were interviewed for enriching the data through observation. This procedure was carried out after considering the suggestions by Mayhew (1999), Dix, Finlay, Abowd, and Beale (2004), and Preece, Rogers, and Sharp (2007).

B. The observation

The children were observed critically while interacting with the digital storybooks. The way they interact with the digital storybooks, with their peers, body language, and

their oral conversations were regarded as meaningful data (Mayhew, 1999). They were recorded for further analysis. When there were meaningful and deviated actions by any child, they were noted for further prompting in the interview (Dix, Finlay, Abowd, & Beale, 2004).

C. The interview

Having observed the children's interaction with the digital storybooks, this study interviewed them, in an unstructured mode (Preece, Rogers, & Sharp, 2007). Generally, the interview questions were addressed to further clarify certain meaningful reactions during the observation. Although the interviews were unstructured, the points of expressions were all regarding the elements that make the children aroused while interacting with the digital storybooks (Mayhew, 1999).

III FINDINGS

During the field study, the children were observed very happy. They enjoyed the sessions very much. Having observed and interviewed their interaction with the digital storybook, this section elaborated the arousing elements in the digital storybook.

In DSB 1, children were impressed with the *page transition*. It flips like a physical book as seen in Figure 2. In Figure 2(a), the page turns when the 'next' button is clicked. Meanwhile, Figure 2(b) shows that the page is flipped by dragging at the vertex.

The *navigation buttons* are in miniature page, labeled with the page number (Figure 3). In Figure 3, a *video* is played, very much impressing the children.

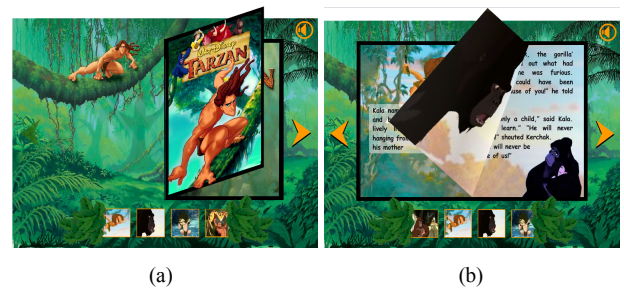


Figure 2. Page transition in digital storybook

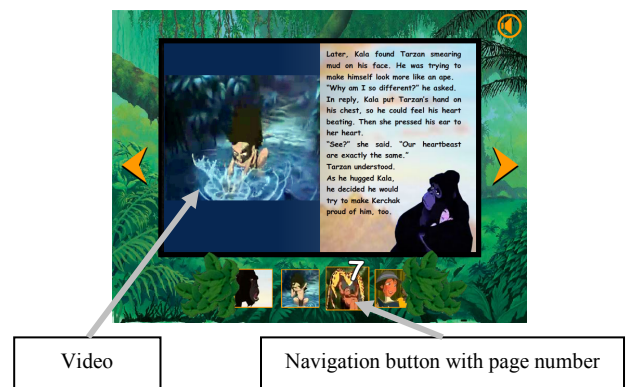


Figure 3. Navigation buttons are labeled with page number

In all pages, the *text is narrated aloud*. The purpose is twofold; to support children reading and to train them reading fast. Besides, the video in Figure 3 is incorporated with *dialogue*. *Background song* is played, which is provided with an *ON/OFF button* (top-right) so that the children could control the audio.

In overall, the layout, structure, and navigation are consistent, with good metaphor for Tarzan. The elements are well-orchestrated. This supports users' task, in which they could develop their mental model about the interaction styles.

However, DSB 1 does not provide any clue to the users regarding the total pages available. This hinders them from estimating the time they have to spend for reading the DSB. Besides, jumping from a page to any intended page is not possible because no hybrid navigation is provided. In DSB 2, the navigation is shown in Figure 4. It is seen that all pages are provided, enabling all pages to be visited by a single click from any other page. This really supports user task as compared to that in DSB 1.

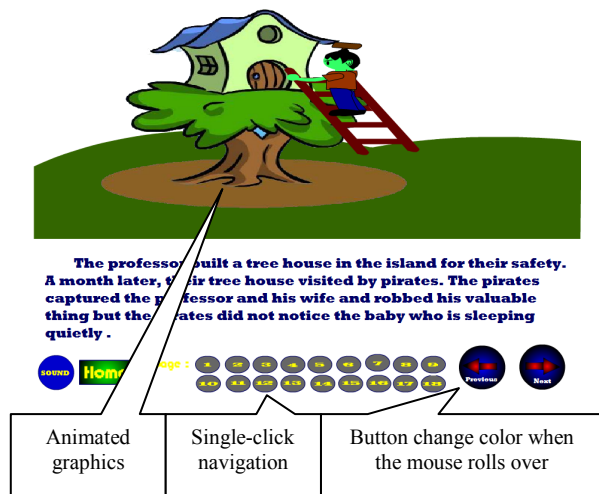


Figure 4. All pages are provided for navigation

The *buttons respond* to mouse rolls by changing color, hinting to the users that they offer certain functions. Some graphics in DSB 2 are *animated*, at minimum level. In most cases, the animated graphics are combined with still background, scanned from other resources.

However, the text in DSB 2 is not read-aloud to the users. This conflicts with the animated graphics, which suits young children. This is because young children need to listen to audio more than reading. Besides, the current *active page is not notified* to the users, forcing the users guess the current page. This unnecessarily creates *cognitive load*.

Similarly, DSB 3 provides single-click page navigation (Figure 5), with notifying buttons. The text is large, but is not read-aloud.

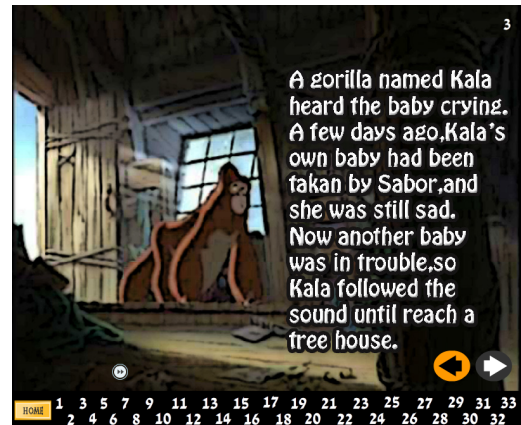


Figure 5. Navigation Buttons Are Labeled With Page Number

However, the page transition (as seen in Figure 6) is not well orchestrated when it comes continuously from the top.

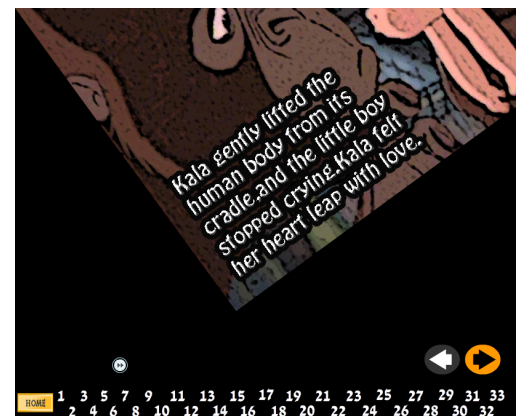


Figure 6. Pages Coming From The Top – Not Preferred By The Children

In contrast to DSB 2 and DSB 3, although DSB 4 applies similar navigation style, the color is not universal, and is not suitable for children. Pink is obviously for girls, hence the boys are not happy to engage. Also, the font (as seen in Figure 7) is not well designed for children, more of teenagers. Moreover, the text is not read-aloud.

Also, Figure 7 exhibits that most elements are not well-orchestrated. As an example, the buttons are typically found in any other applications, making them looking like a patchwork, or addressed as unfinished.

The non-orchestration is also seen in DSB 5 (in Figure 8), in which most elements especially for navigation are not designed according to the context.



Figure 7. Single-Gender Color (Pink)



Elements not designed for the context

Figure 8. Non-orchestrated elements.

Besides, most graphics in DSB 5 are *blurred*, looking like unfinished. It was observed that children are not happy with the blurred graphics. Also, the text is too little, only preferred by seven-year old children. The eight and nine-year old children do not prefer this DSB because they find it too shallow.

As opposed to that, DSB 6 reads-aloud the text. The navigation style is similar to DSB 1. The difference between DSB 6 and DSB 1 is that the narration in DSB 6 is made-over with intonation, stress, and emphasis. This engages the children because they feel being described a story, rather than being read a passage.



Figure 9. Text are read-aloud with proper intonation, stress, and emphasis.

The graphics in DSB 6 are all precise, and the buttons respond to mouse rolls actively. Besides, the metaphor is nice, suiting the context of the storybook. Hence, the elements are well-orchestrated, supporting users' mental and cognitive effort.

Based on the findings elaborated in the previous paragraphs, the recommendations in Table 1 have been deduced.

Figure 9. Recommendations For Children's Interactive Digital Storybook

Navigation	
Hybrid navigation	Hybrid navigation is a must. Users must be allowed to jump to any intended page with a single click.
Notifying buttons	Buttons must respond to mouse rolls, through either visual or audio cue. In terms of visual cue, the buttons could either change their color or grow bigger. They could also be incorporated with some sound effects. Also, buttons should be labeled with respective page number, and every page is equipped with its page number.
Consistent navigation	The styles and location of navigational items must be consistent to support users' mental model.
Obvious navigational elements	The navigational elements must be clear, recognized by the children.
Layout and structure	
Consistency	The screen layout must be consistent.
Avoid clutter	Elements on screen must be minimized. They have to be arranged nicely, following certain design rules such rule of third.
Navigation closed at hand	All navigational elements are located close to each other. They have to close at hand, avoiding users make mistake.
Media elements	
Text	Text is a must in the digital storybook. The selection of type face must meet the context and the children's preferences. Colors must be contrast. Font size must be big enough to support children.
Graphic	Graphic is a must. Graphics must be precise. Graphics must relate to the contents

	in respective page. Animated graphics could be used.
Audio	Provide ON/OFF button or loudness slider. Text must be read-aloud. Narration must apply proper intonation, stress, and emphasis. Background sound must not be more dominant than the text read-aloud. Background sound must pair with pages.
Video	Video is a must. Content in the video must extend the page content. Video must appear as a page element. Video on a page must be short. Many pages can contain video. Content in the video must orchestrate the state of flow.
Animation	Animated characters could be used. Processes could be animated. Avoid long animations. Animations must extend the page content.
Others	
Terminologies	Use simple language, terminologies that are within children's vocab list.
Orchestration	Every element must complement each other, making the screen appearance look well-orchestrated.
Minimize excise	User tasks must be reduced. This involved cognitive and physical efforts. Among appropriate strategies include supporting single-click page jump and use friendly terminologies.

IV DISCUSSION

This study is at the first phase of determining elements of an arousing children's interactive digital storybook. Six prototypes of interactive digital storybooks have been developed in understanding good and bad elements. The findings of this study are very important because they provide practical recommendations for designers to develop interactive digital storybook.

In this study, all digital storybooks contain almost similar elements. However, they are designed differently. It was aimed at understanding what properties make certain element more arousing to children.

Eventually, the differences between good and bad practices are deduced. As an illustration, text should be selected among those tailored for children, the size must be large enough, in contrast colors, and placed at a significant location in the digital storybook. Obviously, engaging users

in developing the digital storybook could help a lot (Druin, 1999).

In current advancement, text alone is not meaningful, because information could be conveyed through rich media elements such as audio, graphic, animation, and video. Hence, they have to be utilized to support multi-modalities, which intensify fun and entertainment (Duncum, 2004; Ariffin, Nurulnawan, & Zatul Amilah, 2011). In the digital storybook, all elements (including video and animation) should be regarded as an element in a certain page, and should automatically play when the page loads. The sound in the video should then automatically stop when the page leaves.

In this kind of interactive product, orchestration and fewer excises are important aspects. Not only they support mental model, and avoid cognitive effort, but also they avoid physical effort. When the digital storybooks are usable, it supports learning significantly (Vygotsky, 1986; Chung, 2006) and provokes wonderful experience (Jesse, 2000).

The data obtained in this study are very strong because they were gathered through observation and interviews in a field study. The six prototypes were developed on similar contents specifically to understand the effects of various elements over users' experience while interacting with the digital storybook.

Eventually, it was obvious that certain elements make children happy to interact with, while certain other make children quickly ignore the digital storybook. This is inline with the discovery by Druin et al. (1999). Obviously, DSB 1 was preferred most by the children, and they were observed interacting with DSB 1 with deep engagement. This is because all elements in Table 1 are well-utilized, except the single-click page-jump and active page number. In contrast, DSB 4 was the most unattended. It is obvious that most elements in Table 1 are not utilized in the digital storybook. In fact, the reactions while interacting with DSB 1 and 4 were completely different, no matter which one was interacted first.

V CONCLUSION

Based on the findings and extended with the discussions, this study has achieved the aim to determine the elements that make children's interactive digital storybook arousing. So far, the gathered recommendations have not been scientifically assessed. Hence, this study will progress by further detailing the gathered recommendations in Table 1. Another systematic field study will be carried out so that the recommendations could be more comprehensively devised for various contexts and themes. Further, prototypes for mobile platforms including applications for cloud storage and collaborative user interventions will be designed. This will involve the children as part of the team as experienced by Jones, McIver, Gibson, and Gregor (2003).

REFERENCES

- Ariffin, A.M. (2009). *Conceptual Design of Reality Learning Media Model Based on Fun and Entertaining Constructs*. PhD Thesis. UUM.
- Ariffin, A.M. (2010). Digital Storytelling: An Easy-to-create Usable Information Conveyor. *Journal of Information Technology Review* 1(1). 34-41.

- Ariffin, A.M., Nurulnawan, A., Zatul Amilah, S. (2011). Digital Storytelling Makes Learning Fun and Entertaining. *International Journal of Computer Applications*. 18(1). 20-26. DOI: 10.5120/2248-2878.
- Chung, S.K. (2006). Digital Storytelling in Integrated Arts Education. *The International Journal of Arts and Education*. 4(1). 33-50.
- Churchill, D. (2007). Digital storytelling. Retrieved September 12, 2007, from <http://www.learnactivity.com/ds/>
- Dix, A., Finlay, J., Abowd, G. D., & Beale, R. (2004). *Human-computer Interaction 3rd edition*. Pearson Education Limited. England.
- Druin, A. (1999). Cooperative Inquiry: Developing New Technologies for Children with Children. *Proceedings of CHI'99*. ACM Press, 592-599.
- Druin, A., Bederson, B., Boltman, A., Miura, A., Knotts-Callahan, D., & Platt, M. (1999). Children as Our Technology Partners. *The Design of Children's Technology* (A. Druin, ed.), Morgan Kaufmann, pp. 51-72.
- Druin, A., Montemayor J., Hendler J., McAlister B., Boltman, A., Fiterman E., Plaisant A., Kruskal A., Olsen H., Revett I., Schwenn T., Sumida S., and Wagner R. (1999). Designing PETS: A Personal Electronic Teller of Stories. *Proceedings of CHI'99*. ACM Press, 326-329.
- Duncum, P. (2004). Visual culture isn't just visual: Multiliteracy, multimodality, and meaning. *Studies in Art Education*, 43(3), 252-265.
- Jesse, J. G. (2000). *The elements of user experience. User-centered design for the web*. USA: New Riders.
- Jones, C., McIver, L., Gibson, L., & Gregor, P. (2003). Experiences Obtained from Designing with Children. *Proceedings of the 2003 conference on Interaction Design and Children (IDC 2003)*, pp. 69-74.
- Lambert, J. (2002). *Digital storytelling: Capturing lives, creating community*. Berkeley, CA: Center for Digital Storytelling.
- Madej, K. (2003). Towards Digital Narrative for Children: From Education to Entertainment: A Historical Perspective. *Computers in Entertainment*, 1(1), 2003, 12-12.
- Mayhew, D.J. (1999). *The Usability Engineering Lifecycle*. Morgan Kaufmann, San Francisco.
- McKillop, C. (2005) Storytelling grows up: using storytelling as a reflective tool in higher education. *Proceedings of The Scottish Educational Research Association Conference (SERA 2005)*, 24-26 November, 2005, Perth, Scotland.
- Meadows, D. (2003). Digital storytelling: Research-based practice in new media. *Visual Communication*, 2(2), 189-193.
- Ohler, J. (2004). *Telling your story: A guide to what makes a story work, regardless of medium*. Retrieved August 20, 2007, from <http://www.jasonohler.com/pdfs/storybook11-v2-original.pdf>
- Preece, J., Rogers, Y., & Sharp, H. (2007). *Interaction Design: beyond human-computer interaction 2nd edition*. John Wiley & Sons, Ltd. England.
- Salpeter, J. (2005). *Telling tales with technology*. Retrieved August 15, 2007, from <http://www.ebookhost.net/tldmc2/fulldoc.html>
- Schilit, G., Golovchinsky, G., & Price, M. (1998). Beyond Paper: Supporting Active Reading with Free Form Digital Ink Annotations, in *Proceedings of the SIGCHI conference on Human factors in computing system (CHI 1998)*, ACM Press, pp. 249-256.
- Schneiderman, B. (1998). *Designing the user interface. Strategies for effective human-computer interaction. 3rd ed.* Addison-Wesley: Reading, MA.
- Tapscott, D. (1999). *Growing Up Digital: The Rise of the Net Generation*, McGraw-Hill.
- Vygotsky, L. (1986). *Thought and language*. MIT Press, Cambridge MA.