

Review article

AN EVALUATION TOOL FOR STORY-RELATED INTERACTIVE FEATURES IN CHILDREN APP-BOOK

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ABSTRACT

This study discusses existing analysis tools that evaluate the quality of interactive feature inside children app-book especially its correlation with the story in order to find a better app-book design to support story comprehension for young children. To implement the evaluation, a narrative review approach is used from selected studies and field. Five analysis tools related to e-book design were reviewed based on their purpose, coding, advantages and limitation. For knowledge base, the study seeks across interactive design field along with children literature and children education field to presents what it needs to produce coding for story-related interactive feature. The combination between existing analysis tool and literature studies are extracted into coding of story-related interactive feature. Finally, the result presents an evaluation tool with coding which can define the correlation function between interactive features in story inside children app-book, which also can improve users' story comprehension.

Keywords: Usability analysis, children app-book, touch user interface

1. INTRODUCTION

The digital literature era has brought rapid transformation to children literature and media, from edutainment application to digital picture book. Each of media offers new method to support story understanding through their interactivity that a traditional media does not have. The popularity of digital media has also adding mobile device as a part of many researches from literature to education in classroom activity [1-5]. The rapid development of mobile device including app-book has also encouraging scholars to create evaluation tools in order to find a better interactive feature for user. Most of analysis tools analyze the usability of the device as a whole [6-9] while few tried to analyze the details beyond devices' interactive features and how it brings different type of knowledge for literacy learning [10-12].

We believe that connection between interactive feature and story inside story, whether inside app-book or other application will improves the distribution of information between device and user. Thus we interested in investigating whether the connectivity between interactive feature and story are already included inside the coding in existing evaluation tools and what kind of assessment can we imply to analyze the correlation between interactive feature and story. The study itself focuses on storytelling app-book as its feature has

clear function and limitation. To answer the question this study collected existing analysis tools focusing on the usability of interactive feature inside children app-book. All the tools were reviewed according to their focus, coding, strength and limitation. This study was also seeks knowledge from previous research on three different fields: interactive design, children education and lastly children literature field to investigate needed coding in the new tool. The collected information was analyzed to produce a new coding of analysis tool for story-related interactive feature in children app-book. Our thinking method frame is as seen below.

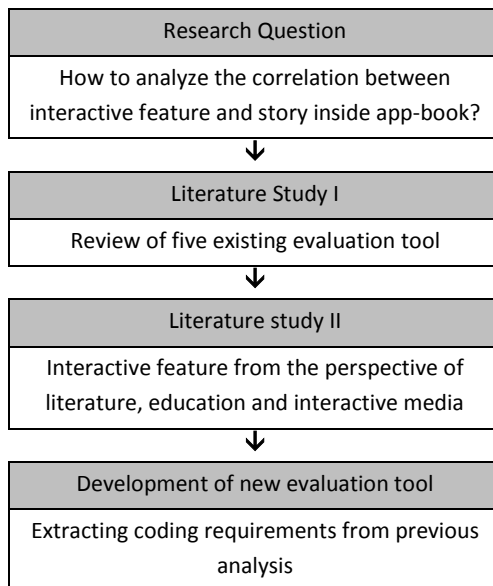


Fig 1. Materials and methods of the study

2. EVALUATION TOOLS FOR MOBILE DEVICES

Previous studies have created diverse evaluation tools in mobile device to bring better application for user. The studies cover not only the device's usability but also the interactive feature inside it. In order to find better evaluation tools, we review five different evaluation tools for mobile device, website, and e-book according to their preferences.

2.1. Evaluation tool for mobile device' usability

Heuristic evaluation [13] is originally an analysis tool created to evaluate the usability of website application and has been used to evaluate e-book as well as other mobile devices. The tool's coding spread in ten principles called heuristic, which connected to usability function of the device. Its principles include visibility of system status, match between system and the real world, user control and freedom, consistency and standards, error prevention, recognition rather than recall, flexibility and efficiency of use, aesthetic and minimalist design, help users recognize, diagnose, and recover from errors, and help and documentation. Some of researcher however modified the coding according to their research needs [14]. The advance of heuristic evaluation is it brings comprehensive evaluation for interface usability with quicker, cheaper, and

easier method as it can be performed with minimum three expert evaluator.

Another well-known evaluation tool for mobile device's usability is Web content accessibility guidelines (WCAG) 2.0. The tool evaluates general access in content area and specialized for user with disabilities. It has four principles called POUR (perceivability, operability, understandability, and robustness) with total of 12 guidelines inside each principle [15]. The mechanism of WCAG 2.0 brings advance in covering wider user, especially user with disability. Both of heuristic evaluation and WCAG 2.0 however has similar limitation in revealing details inside device aside from its usability.

2.2. Evaluation tool for mobile device's multimedia feature

While Heuristic evaluation and WCAG 2.0 cover comprehensive analysis in mobile device's usability, a number of past researches tried to identify and analyze multimedia features inside mobile device. Clark & Meyer produced another analysis tool that focuses on multimedia feature inside e-book, which advances in giving details knowledge types in graphic and multimedia element. The tool also capable in describe personalization element that motivates attention and pedagogical assist. The coding includes five principles: multimedia, contiguity, redundancy, coherence, and

personalization, along with five types of graphics addition: decorative, representational, organizational, relational, transformational, and interpretive [11]. This tool however has limitation in identifying interaction design area and how it is being represented in e-book.

In order to analyze user behavior toward e-book interface, Roskos, Brueck, & Widman introduced Blueprint Key Tool, a analysis tool that give a clue of user behavior and action in choosing the features through flowchart map from first action to another within application's pages [12]. The tool however has limitation in locating evidence of knowledge types in design architecture. The analysis process will also take longer time to construct, as it requires high degree of multimedia learning knowledge from the reviewer.

On their research, De Jong and Bus focus in identifying design categories that serve as a macro-framework for evaluation of e-book construction [10]. Its five coding includes audio, video, and text in multimedia factor along with choice, control, and engagement in design factor. The strength of this tool is it can identify multimedia core elements for literacy learning and reveals design elements that support learning look in the e-book. The tool however has limitation in revealing pedagogical assists

function and types of knowledge inside e-book's environment. It also failed in identifying cognitive demand of the e-book. The brief review from five analysis tools is as seen in table 1.

One of the coding from their tool however reveals how multimedia in picture can carry not only details from the text but also conveys some of the text's fragment and even dramatize the whole scene. De Jong and Bus argue that dynamic visual or moving images can convey feelings, mood and other associations with story, thus improve children's personal response; a response that connect story with reader's real experience [16]. According to them there are three ways in how multimedia in pictures can correlate with story. The first degree is by becoming its details by applying multimedia item as visual decoration and adds more fun aspect without relevancy necessity with the story. The second degree is what they named it as fragment, a multimedia feature that imitates parts of the text in the story. The last degree is when it's not only imitates but also dramatizes the story and adding deeper meaning into it. The coding however focuses solely on dynamic visuals as its subject. We believe that the using of coding above can be applied in different part aside from dynamic visual to reveals the usability of interactive features.

Table 1. Comparison of Usability Evaluation for Mobile Devices

Nielsen (1995)	
Focus / Purpose	Comprehension evaluation in user interface inside application
Coding	Checklist set with 10 principles called 'heuristic'
Advantages	Quicker, cheaper, and easier evaluation method for user interface usability evaluation
Limitation	Focuses only in usability area.
World Wide Web Consortium (2008)	
Focus / Purpose	Evaluation on general access in mobile application's content area specialized for disable user
Coding	12 guidelines in principle called POUR (Perceivability, operability, understandability, robustness)
Advantages	Accessible for wider user (user with disability)
Limitation	Focuses only in usability area.
De Jong & Bus (2003)	
Focus / Purpose	Evaluation on app-book's multimedia effectiveness and graphic interactivity addition for literacy understanding
Coding	Book processing, Multimedia in picture, Multimedia connected to printed or spoken text, Interactivity of the story, Interactive legibility
Advantages	Identify and reveals core elements of multimedia along with design element that support literacy
Limitation	Unable to reveal pedagogical assists function and types of knowledge inside app-book environment, and can't identify cognitive demand of the app-book.
Clark & Meyer (2008)	
Focus / Purpose	Identify the knowledge inside graphic and multimedia feature inside app-book
Coding	Multimedia, Contiguity, Redundancy, Coherence and Personalization with addition of five graphic types in multimedia design.
Advantages	Gives detail on types of graphic knowledge & multimedia elements, personalization element that motivate attention, and pedagogical assists.
Limitation	Limited in interaction design area and how it is being represented in app-book.
Roskos, Brueck, & Widman (2009)	
Focus / Purpose	Investigation of learning-oriented assembly
Coding	User behavior investigation through action's flow map
Advantages	Reveals user behavior and act in choosing application's feature
Limitation	Limited in locating evidence of knowledge types in design architecture. Requires high degree of multimedia learning knowledge to use the tool and longer time to construct the evaluation.

3. WHAT WE NEED IN STORY-RELATED INTERACTIVE FEATURE

Based on the review, we conclude that most of methods we found focus more in either the whole usability of the device or focus in its interactivity usability and its correlation with literacy comprehension. The tools above seem to forget the role of hotspot inside gesture

or touch user interface (TUI), which operate most of interactive feature in children app-book.

Gesture itself can be defined as any physical movement that can detect and respond without the help of a traditional pointing device such as a mouse or stylus [17]. Most gestural interfaces or touch user interfaces (TUI) can be categorized

as either touch screen or freeform. Different mobile platforms can perform various TUIs according to their user preferences, thus create diverse customization possibility for each app-book platform.

To find out the needs from story-related interactive feature this study focuses on TUI as the object of analysis. Literature source from three different areas connected to interactive design, children education and children literature field are use to backup the hypothesis. While interaction design field provide TUI as the object of this study, children literature enrich the knowledge of emotive expression and personal response which can be achieved through interaction between user and story. Children education field shows how interactivity are used for education and how children response to the tools.

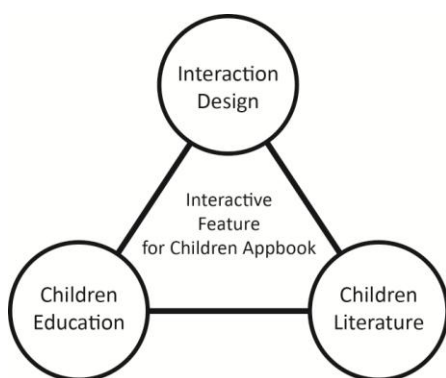


Fig 2. The correlation between three different fields with interactive feature in children app-book

3.1 Interactive feature as a container of literature expression

Nikolajeva & Scott believes that the collaboration between text and image in traditional picture book creates seven elements of literature expression: setting, characterization, narrative perspective, time and movement, mimesis and modality, figurative language, and lastly metafiction, intertext, and paratext. These elements have potential in helping readers understanding the story development and its plot [18]. Aside from literature expression, Nikolajeva also found that character in picture book acts as a narrative agent which connects author, narration, and readers as a whole [9]. App-book however offers a new channel for this expression inside their interactive feature.

In their experiment, Moon and Choi argue that not all of interaction feature in existing app-book includes literature expression. The absence of the literature expression are not only produce meaningless interactive feature which not correlated with the story, it also tackle the storytelling process with distraction. They also found that the more literature expression includes in interactive feature, the more it will be related to the story, helping children to reach higher story comprehension [20].

3.2 How Children respond to interactive feature

The development of mobile device and interactivity in education field has brought a lot of research on the connection between children as young children and their respond to the device. A research from Michael Cohen Group LLC revealed how three age groups of children respond to iPad's interactive feature and its touch screen and how tablet device bring immersion by offering interactive experience that mirrors children's natural constructivist learning [21]. Researches also agree that tablet device can integrate into the daily life of students and redefine the learning space constitution by providing no constraints of specific time and play [22].

Despite of its immersion, according to some studies, the embeded non-related content inside interactive feature in enhanced e-book may distract young readers from storytelling process [23] including embedded hotspot and animations inside illustration, games, and video inside app-book [24]. Another studies examined how small size of touch screen's input area creates difficult task for infant and young children. Small symbol for text button, navigation and other interactivity function can also tackle the literacy comprehension, as it is difficult to recognize by the reader. [25]

Aside for the famous use of "tap" and

"drag/slide" command in app-book, young children age four and above are surprisingly competent with diverse command like free rotate, pinch, flick, and spread [17]. Meanwhile Park also find that improving graphic interactivity to TUI brings more familiarity to the degree of interaction between user and character that resulted in improvement of gesture manipulation and icon usability [25].

4. CREATING A STORY-RELATED INTERACTIVE FEATURE

From the information above we can conclude that there are three important things to investigate the correlation between interactive feature and story inside app-book: The availability and visibility of the interactive feature, its function relating to the story, and how it delivers the emotive expression within its visual. As discussed above, the visibility of interactive feature is important as children need to recognize it first before they can interact with it. The availability and visibility of one's feature can be determined by its feature (visual effect, sound effect, etc) and how they are translated into pleasing visualization (font, color, and size choices). Not only easily to recognized, the feature need to be easily executed by young children and the execution itself would not disturb the storytelling process.

The second criterion is the function of interactive feature related to the story. As De Jong and Bus revealed in their study, in order to analyze whether an interactive feature can improve story comprehension we need to find out either if it only decorate the text, act as a text representative or even enrich the story with dramatizing effect. However instead of moving images, TUI especially

hotspot button would be a better analysis object as it has more potential in connecting user with the story while delivering the story message.

The last criteria to be included is how interactive feature deliver emotive expression from the story through its visualization, whether in color, pattern, movement or sound and stimulate the emotion within characters and story.

Tabel 2. Codings for hotspot evaluation in children app-book

Coding		Qualification
Availability, visibility, and usability		<ul style="list-style-type: none"> • Includes sound and visual effect • Visually pleasing with font choice, color and sizes • Easily recognized by children • Easily executed by children • The execution of interactivity does not disturb the storytelling process
Connection with story	Decorative	<ul style="list-style-type: none"> • Enjoyable and interesting • Can gain children’s attention • Gives frequent feedback to carry on
	Fragment	<ul style="list-style-type: none"> • Represent one or some part of the text • Makes children engaged with the story
	Dramatizing	<ul style="list-style-type: none"> • Gives different meaning apart from text yet enrich the story • Allows children to enhance story comprehension
Emotive expression		<ul style="list-style-type: none"> • Its part (color, font, line, pattern) and execution’s output (movement, sound, etc) stimulate particular mood in the story • Its part and execution’s output (movement, facial expression, voice, etc) represent character’s characterization and character’s emotion

5. CONCLUSION

The rapid development of interactive app-book has leads growing number of researches that provide analytic tools to examine the construction of interactive feature inside app-book. By providing the construction and usability of the interactive feature, not only deliver multimedia learning, an analysis tool can give an insight of better interaction between a story and user.

After reviewing five different evaluation tools we found that most of them ignore the TUI function despite of its direct interaction with user and story. The previous tools also have limitation in revealing the correlation between interactive feature and story, which has big role in improving story comprehension. To construct new analytic tool we combined three different aspects from literature, children

education, and interactive design field and extracted important criteria for story-related TUI inside hotspot button. The codings are divided into three aspects: the acknowledgement of TUI availability and usability from user, its function related to the story, and emotive expression within TUI. The second coding especially will determine how far a TUI button connecting with story.

While our evaluation tool answered our research question for the criteria of storey-related interaction feature, we believe that the function and limitation of the tool need to be proven with an assessment of actual app-book. We also hope that the tool will be useful for future research in children digital literature and interaction design area.

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