A PARTICIPATORY LEARNING FRAMEWORK FOR ENHANCING CHILDREN'S READING EXPERIENCE WITH ELECTRONIC BOOK READERS

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As electronic book (e-book) readers are increasingly applied in educational contexts, it is becoming imperative to explore issues of how to integrate these new reading devices with pedagogical principles. To achieve this goal, this study proposes a participatory learning framework to design reading activities with e-book readers. Such a framework addresses the integration of individual reading, collaborative learning and a learner community, and highlights the role of parents in assisting children to engage in reading communities. An evaluation found that e-book readers are helpful in this framework in facilitating parent-child interaction. The findings also show that the collaborative storytelling activity on the e-book readers may afford a variety of forms of interaction. Three major parent-child interaction patterns were also found. Each pattern facilitated the parents to apply certain types of dialogic reading strategies. Further discussion of the findings with regard to parent-child reading and its educational implications is included.

Keywords: Electronic book readers; participatory learning; dialogic reading; collaborative learning.

1. Introduction

Recently, many e-book readers such as iPad and Kindle have become popular because of the widespread use of touch-screen tablet devices. Such e-book readers may be helpful in enhancing learning-to-read activities because they are equipped with many features that cannot be supported by traditional books. For instance, e-book readers may support a richer presentation by combining oral narration, animation, and texts which may improve children's understanding of the content and their verbal ability (Korat, 2010). Barker (1999) indicated that e-books are capable of carrying dynamic and reactive multimedia

contents, hyperlinks, and fast searching, which have made these characteristics advantage over paper books for learning to read (Shiratuddin & Landoni, 2003).

However, simply adopting e-books readers does not necessarily guarantee improvement in the reading process. For instance, Rabina and Pattuelli (2009) found that the current e-book readers may not fully support reading as expected. Such a finding is consistent with the results of the e-book readers study pilot at Princeton (http://www.princeton.edu/ereaderpilot/) which indicated that e-book readers still cannot fully support sophisticated reading strategies such as labeling, marking and underlining in a natural way. To address such issues, researchers such as Wightman, Ginn, and Vertegaal (2010) and Yoon, Cho, Yeom, and Park (2011) have proposed several novel designs with regard to the functionalities that may enhance page turning, annotation, and navigation while using e-book readers. However, the above studies mainly focus on enhancement of the usability of e-book readers for supporting individual reading needs. How these readers may be applied to enhance the learning-to-read activities of children and their parents is still not clear.

In recent years, many countries have begun to initiate pilot programs that use e-book readers as a replacement of paper-based textbooks in the formal education system. For instance, Taiwan Ministry of Education announced a pilot program of e-school bag in ten elementary schools. The e-book readers were used as textbook readers. Although the e-book readers may be changing the practice of reading from the paper-based to e-books, the study by Okolo and Hayes (1996) found that overly-rich animation may linger the understanding of the text content correctly for children. Thus, the guidance for e-book reading with children becomes crucial as the literature has further suggested that parents' or teachers' involvement is important to guide students to read when e-books readers are used (Robb, 2010). In addition, it is reported that parents think e-book readers cannot afford the intimacy and emotional experience that the paper books can offer when reading together with their children (Richtel & Bosman, 2011). This may be partially because the e-book readers are merely used as another form of the paper books and do not utilize the features of e-book readers to support parent-children interactions. Nevertheless, how the e-book readers can be used to support the social process in which both the children and parents can be engaged in the learning-to-read activities is somewhat limited in the literature.

Many researchers have confirmed that in order to develop children's reading skills, parents or instructors have to guide their participation in reading (Wasik & Bond, 2001). Such a perspective of reading suggests that learning-to-read should not be a solitary activity. Rather, it should be a social activity because active reading can be involved in social contexts (Cairney, 2003; Kaplan & Chisik, 2005). As a result, many researchers have adopted the Vygotskian framework to understand how parents may guide children to read, and how this guidance may influence their reading quality and language development (Wasik & Bond, 2001; Whitehurst et al., 1988). These studies suggest that with parents' scaffolding, children can achieve a higher level of language development (Whitehurst et al., 1988) as the scaffolding can fit the child's zone of proximal

development (Fletcher & Reese, 2005; Vygotsky, 1978). The social interactions involved in the context of learning-to-read involve adults, children and the books (van Kleeck, 2003). However, the above studies focus on the social interactions which occur with paper books. As the e-book readers have been becoming popular, there is a need to investigate how these e-book readers may be applied to enhance learning-to-read activities.

To address the above issues, this paper proposes to apply a participatory learning model (Brown & Adler, 2008; Fischer & Konomi, 2007) to enhance learning-to-read activities with e-book readers. The participatory learning model aims to relocate the role of e-book readers by strengthening the relationship among reading strategies, child-parent collaboration, and experience sharing in reading communities. Such a model echoes the viewpoint of participatory learning in which "learners are active participants or co-producers rather than passive consumers of content, and so that learning is a participatory, social process supporting personal life goals and needs" (McLoughlin & Lee, 2007, p. 664). In other words, this model aims to help children apply reading strategies through child-parent collaboration promoted by a reading community. The role of e-book readers becomes critical in this model because they are equipped with touch screens and wireless communication capabilities which may facilitate diverse types of scaffolding and participatory learning activities.

It is necessary to engage both children and parents in a reading task where they collaborate with each other to produce artifacts according to the participatory learning model (Barab et al., 2000). Therefore, this study applied storytelling activity as a means to fulfill the participatory learning model. This is because while telling a story, children have to organize, communicate, evaluate and transform life experience in their own voices (Liu, Chen, Shih, Huang, & Liu, 2011; Pirrie, 1999). In this vein, this study developed a collaborative storytelling application on e-book readers based on the proposed model. More specifically, with the aid of the readers, children and parents may actively and collaboratively read and tell stories in a reading community. It is hoped that this model can improve children's reading experience through the collaborative and participatory learning activities.

This study conducted an activity to investigate the effect of the participatory learning model on children's learning-to-read activities. By gathering the activities demonstrated by ten child-parent pairs, this study aimed to investigate how parents may guide and interact with their children to read in the participatory and collaborative reading activities. The following research questions were used to assist the investigation of the current study.

- What are the parent-child interaction patterns observed during the reading activities with e-book readers?
- What are the dialogic reading strategies observed during the reading activities with e-book readers?
- What are the parents' perceived guiding behaviors during the reading activities with e-book readers?

● What is the parents' perceived effectiveness toward the participatory reading activities with e-book readers?

2. Related Works

2.1. *E-book development and evaluation*

E-book readers have been rapidly evolving in recent years. Major attention has been paid to those mobile e-book readers such as the iPad or Kindle on the commercial market. However, previous studies by Liesaputra and Witten (2008) and Rabina and Pattuelli (2009) indicated that e-books still cannot support sophisticated reading activities such as free styles of annotation and easy accessibility that paper-based books can easily afford. Therefore, technical studies have started to redesign new forms of e-book readers. For instance, Chen, Guimbretiere, Dixon, Lewis, and Agrawala (2008) and Chi, Hong, Heiser, and Card (2004) proposed new e-book readers with dual screens that can support more complicated individual reading tasks. Such a redesign may enhance individual reading tasks. Differing from these designs, Kim, Farzan, and Brusilovsky (2008) extended e-book readers to support social navigation. With such e-books, readers may exchange and share their annotations within a reading community.

The above literature mainly focuses on the technical development of e-book readers for mature readers. Recent studies have also begun to investigate the influence of e-book readers on children at the learning-to-read stage. For instance, the study by Lewin (2000) indicated that the oral reading feature of e-book readers may positively influence language learning outcomes. Moreover, in the study by Korat (2010), she found that oral reading of e-books with the use of dynamic visuals might have a positive effect on word reading ability. This is because reading such e-books increases children's phonological awareness (Chera & Wood, 2003) and story comprehension (Grimshaw, Dungworth, McKnight, & Morris, 2007). Furthermore, the computational power of the e-books may play a role in providing scaffolding which supports vocabulary development, engagement, and comprehension (Moody, 2010). However, simply applying e-books cannot guarantee the improvement of reading skills. For instance, Okolo and Hayes (1996) indicated that fancy animation may mislead students into drawing wrong conclusions about the text. They further stressed that adults' support can increase children's performance in reading comprehension. The study by Robb (2010) echoed such findings, indicating that parental involvement may play a more important role than the interactive components and seductive details in improving the reading with e-books. These studies suggest that it is necessary to develop a pedagogical participatory approach that can facilitate parent-child reading activities with e-book readers.

2.2. *Participatory learning*

Participatory learning is advocated by many educators. In such a learning context, learners go beyond consuming knowledge given by the textbooks or teacher. It creates a platform for learners to produce artifacts that contribute to the community of learners

(Brown & Adler, 2008; Fischer & Konomi, 2007). The notion of participatory learning is consistent with constructionists' perspective that learners have to construct artifacts and interact with the learner community (Harel & Papert, 1991). Due to this pursuance of constructionism, the learning context is often collaborative because learners need to collaborate with others in an attempt to create artifacts (Barab et al., 2000). Therefore, such learning contexts provide a means for "learning to be" an expert (Brown & Adler, 2008).

Information and communication technologies may facilitate participatory learning. In particular, Web 2.0 platforms enable learners to produce micro-content and interact with other learners in the community of learners. At the current stage, emerging Web 2.0 platforms such as Wiki (Su & Beaumont, 2010), blogs (Lu, Lin, Hsiao, & Cheng, 2010), and social network platforms (Wang, Woo, Quek, Yang, & Liu, 2012) are extensively applied to support participatory learning. These platforms may be helpful in fulfilling the goals of social learning in different forms, such as collaborative writing, brainstorming, course development, and research projects (Duffy & Bruns, 2006; Tonkin, 2005). A survey of using Web 2.0 platforms to support educational objectives was presented by McLoughlin and Lee (2007). For instance, in the study by Kukulska-Hulme (2006), students who were learning a second language recorded their interviews with native speakers and shared their coursework with their peers. In the studies by Lessig (2005) and Gustavson (2008), students were encouraged to use multimedia created by others as resources to compose their articles to advance their writing or narratives.

The above studies demonstrate the role of Web 2.0 platforms in facilitating participatory learning. However, the participants involved in these studies were mature learners who could develop their own works and participate independently in the learning activity. How children may participate in learning-to-read participatory activities and how parents may provide scaffolding is still not clear. This study thus attempts to investigate how participatory learning can be restructured to help children learn to read in a community of learners with the use of e-book readers.

3. Participatory Reading with e-book Readers

To help children learn to read in a community, this study developed a participatory reading framework that highlights children's participation in a reading community through the use of e-book readers. Figure 1 illustrates how the participatory reading framework is applied to enhance children's reading experience. Unlike the participatory reading activities designed for mature readers, the participatory reading framework addresses child-parent collaboration because children need extensive supports to apply effective reading strategies. Therefore, the core of the framework is based on a story that is read and told through the child-parent collaboration during a reading activity. During the collaboration, parents could apply dialogic techniques such as questioning, recall, summarizing and distancing to guide their children to read. Moreover, this model requires a reading community where the children and parents can share their reading experience
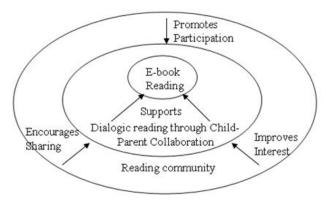
Figure 1. Theoretical framework of participatory learning for learn-to-read children.

and artifacts. Through participating in the sharing activities, the children are more likely to be engaged in the participatory activity and to become active readers.

The model aims to improve reading experience with e-book readers based on individual (Robb, 2010), collaborative (Wasik & Bond, 2001; Zevenbergen & Whitehurst, 2003) and community perspectives (Brown & Adler, 2008; Fischer & Konomi, 2007; Tay, Lim, Lye, Ng, & Lim, 2011) and is detailed below:

- Individual reading: The e-book readers may afford an appropriate medium for children to read individually or with their parents.
- Collaborative reading: Children and parents collaboratively tell the story of a book with the e-book applications. While telling the story, the children may show how they understand it and their parents can provide support to help them read it.
- Community reading: Children can share the story they have told in a reading group or community that sustains their participation in the reading activity.

E-book readers may be helpful in integrating the above three levels of reading in a participatory reading activity. More specifically, they afford a platform for children and parents to read and work together since the touch screen of the readers allows both children and parents to develop a multimedia story collaboratively. Such an affordance allows children and parents to tell a story and make it a permanent multimedia story. The wireless communication capabilities of the devices also allow the parents and children to upload their multimedia stories onto the Web 2.0 community. Thus, the collaborative reading experiences are made public on the web, allowing for viewing by peers. Such a socialized setting is expected to motivate children to participate in the reading activity.

3.1. *Child-parent collaborative storytelling using e-book readers*

It is stated that most of children are not able to productively participate in the participatory reading activities (Kaplan & Chisik, 2005), but require parents' or adults' support. Dialogic reading strategies may be helpful to guide young children to participate in such reading activities. Previous studies have proposed different strategies include interactive book reading techniques (Wasik & Bond, 2001), PEER (prompt, evaluation, extend and repeat) and CROWD (completion, recall, open-ended, wh-, and distancing prompts) (Zevenbergen & Whitehurst, 2003). However, while applying these strategies, teachers and parents need to adopt appropriate pre-defined structures to provide scaffoldings according to the features of the reading activities (Clark & Graves, 2005). To address this issue, this study applied collaborative storytelling as the major activity to elicit the dialogic reading strategies. As children tell the stories they have read, parents are able to precisely assess how their children read and understand the story and thus provide timely supports. This study developed a storytelling application to facilitate the child-parent collaborative storytelling activity. Figure 2 shows the interface of the storytelling application. To facilitate the collaborative storytelling, three previously mentioned issues were taken into consideration in the design of the application:

- Facilitating high level reading strategies: The storytelling application adopts an episode-based design aiming to facilitate children to read stories. More specifically, each episode only shows one important development in the plot of the story. In addition, children could only use a maximum of four episodes to summarize a story in this application. With such predefined constraints, parents need to provide the children with support so that they can accurately extract and tell the stories.
- Enabling easy parent-child interaction: The application was developed for iPad, a tablet-based device. This would allow pre-literate children to externalize their understanding and draw the story they have read by tapping on the screen. The children and parents can sketch the story through episodes by utilizing the features of the application.
- Supporting dialogic reading strategies: To support the dialogic reading strategies, the application supports voice recording for each episode. Children and parents are able to record voice narration for each episode. While children narrate the story they have read, parents can provide prompts to help them recall the story or open-ended questions to assure better understanding.

Figure 2. The storytelling application on iPad.

By tapping a record button, the storytelling application records the voice narration along with the episode. Narrating stories collaboratively along with the visual drawings has proved to be more motivating and engaging (Liu et al., 2011). It is hoped that the integration of multimedia components such as voice narrations and drawings could help parents elicit effective prompts to facilitate children to read.

3.2. *Promoting participation in reading communities*

Children and parents construct a multimedia story in the collaborative storytelling activity. Because the story is recorded in a digital form, it becomes a sharable, accessible, and durable artifact. Children may thus become more motivated to elaborate their artifacts. Therefore, this study integrated the collaborative storytelling activity with two learning-to-read activities to transform the reading experience:

● Reading group: The collaborative storytelling activity was integrated with a reading group. Because the stories were recorded in a digital form, the children can share their stories with any peer in the reading group using their e-book readers. Parents of the reading group may encourage children to share what they have read with the story they developed on their e-book readers.

● Web 2.0 reading communities: Based on the constructionist's perspectives, there is a need to support a public space which allows collaborative process of communication and interaction therein a shared body of knowledge may be built (Harel & Papert, 1991). The collaborative storytelling activity was also integrated with an online Web 2.0 platform. With such an online platform, children and parents from different locations can share the stories they told on the Internet. Additionally, the reading activity can be extended to a connected online community. More specifically, children and parents could publish their stories on a public Web

Figure 3. The online Web 2.0 platform for sharing stories.

2.0 platform via the storytelling application developed by Liu, Liu, Chen, Lin, and Chen (2011). This public platform was mainly designed to support children's storytelling activities. Users of this platform may watch the multimedia stories created by other children and parents.

The Web 2.0 platform, as shown in Figure 3, exhibits a story by displaying each episode on a web page. Both the reading group and the online Web 2.0 platform provide an open space to share the reading experience. It is hoped that such sharing platforms may transform the learning-to-read activity to become a community activity.

4. Method

The current study sought to understand how children and their parents may interact with each other to read in the participatory and collaborative reading activities utilizing the e-book readers. Such a research goal is consistent with the research objectives of computer-supported collaborative learning (CSCL) research concerning "the practices of meaning-making in the context of joint activity, and the ways in which these practices are mediated through designed artifacts" (Koschmann, 2002, p. 18). Literature of CSCL has suggested several compelling research paradigms. For instance, an "effect" research paradigm may be helpful to study the after-effect of the learners' performance with CSCL, and the "conditions" research paradigm may be beneficial to understand in what conditions the collaborative learning can be effective (Dillenbourg, Baker, Blaye, & O'Malley, 1996).

However, Dillenbourg and his colleagues argued that such paradigms may miss approaching the "interaction" among the group members (Dillenbourg et al., 1996). Therefore, the "interaction" paradigm which closely observes and describes the participants' behavioral patterns of interactions as intermediate variables to understand the effect of collaboration is necessary. Several studies have applied such paradigm to

investigate the interaction patterns associated with collaboration. For instance, in the study by Schrire (2006) and Chung, Lee, and Liu (2012), they conducted studies to reveal the interaction patterns occur in collaborative learning mediated by computers. They further confirmed that such interaction pattern may influence the quality of learning outcomes. Therefore, rather than stressing on studying the effect of the participants' performance, this study analyzed the discourses and collaboration behaviors between children and parents in a reading activity to understand what interactions may be afforded by the e-book readers. To be specific, the interaction patterns the parents may have taken to facilitate their children's understanding of the reading using the e-book readers, the meanings of these behaviors, and their overall perceptions toward such a setting, would be studied.

4.1. *Participants and the reading group*

The main focus of the current study was to examine how children and parents might interact with each other to read in the participatory and collaborative reading activities. This study was thus conducted in an informal learning and community-based setting, rather than in a school setting. To address this need, this study located a residential community with 110 households in northern Taiwan. Such a residential community is typical in Taiwan. Therefore, the observation of the reading activities is helpful for the understanding of how the participatory reading activities with e-book readers can be applied for supporting community-based reading activities. The participants were ten children aged from 3 to 8 and their mothers who came voluntarily from this community upon an invitation of public announcement posted in the community. These participants then formed 10 parent-child groups with one child and his or her mother. All the mothers possess at least a college degree.

4.2. *Procedure*

The presented study investigated how the participatory learning approach may influence children's reading and child-parent interaction in a reading community. The reading group took place once a week for two hours and lasted for six weeks. It was concerned that due to a sense of curiosity when encountering the iPad during the first few times of the activities, a higher level of children's engagement in the participatory reading activity might be interfered with the actual observation. Therefore, the scheduled observation of this study was extended to a total of six weeks of the activities to eliminate a potential in this regard. It was observed in the first week that the children were excited about using the iPad and played other built-in games in the iPad. However, in the second week, most of the children focused on the reading and storytelling activity without being distracted with the other features. Therefore, it is reasonable to schedule a six-week-term of observation to answer the research questions of this study.

The reading group read one e-book story each week. All parent-child pairs were given an iPad with the pre-installed e-book stories and the storytelling application. Each week, one mother from the participants started by narrating an e-book story on their iPads. After

the narration, with the help of the storytelling application, the children and their parents started to read the story by themselves and took part in the collaborative storytelling activity (described later) which lasted for approximately one hour. The multimedia stories told by the children and parents were then uploaded to the Web 2.0 platform. All the participants could browse all the stories developed by the other children and parents at any time. The multimedia stories were also displayed on a large screen during the activity so that all the children knew how the other children told the story.

After the storytelling activity, the children could also present their stories to the other children and parents using their iPad. The voice narrations of the stories were recorded with the storytelling application. This study further analyzed the voice narrations to understand how the children told the stories they read, and how the parents guided their children to understand the stories. In addition, the whole reading group activity was videotaped during the entire six-week activities for further analyses on their interaction patterns.

4.3. *Collaborative storytelling activity*

The children and parents collaboratively told the story they read in the reading group using the storytelling application on the iPad. In order to elicit a summary strategy, the children and parents were asked to retell the story they read with four episodes of drawings during the collaborative storytelling activity. The parents may play an important role in guiding the children to summarize and retell the story. There are two parts of the recording of the activities, including the voice narration and the activity videos. Regarding the activity videos, this study videotaped the storytelling activity to understand how the parents used the e-book readers to provide supports to help their children draw important storyline with episodes. Regarding the voice narration, the iPad storytelling application recorded how the parents guided their children to tell all episodes they drew. How the parents guided the children in telling the stories in the activity videos and voice narrations were therefore analyzed. The focuses of such analyses were to reveal the patterns of the child-parent interactions during the collaboration and the role of collaborative storytelling on the e-book readers.

4.4. *Questionnaire*

A questionnaire for the parents was applied after the entire six-week activities for a better understanding of the parents' perceptions of the reading activity. The questionnaire was adopted from a non-profit foundation in Taiwan which is devoted to early childhood education and development (Hsin-Yi, 1990). The definition, purpose and sample items of each dimension are presented in Table 1. To obtain a comprehensive understanding, the questionnaire was used to collect information about the guiding and reading behaviors. Therefore, the questionnaire surveyed the parents' perceptions associated with the parent-child reading activities. More specifically, the questionnaire includes seven questions asking the parents about their perceptions of how they assisted the reading process. All of the items in this guiding behavior dimension (i.e. dialogic reading strategies) asked the

Table 1. The main purposes and example items of the questionnaire.

Dimension	Purpose	Example questions
Guiding behavior	To understand how parents perceive their guiding behaviors	Did you ask your child questions to ensure his/her comprehension of the scenario?
		Did you try to guide your child to grasp the main points of the story?
Learning effect	To understand how parents perceive the effect of the reading activity	Do you think that your child could independently summarize the story in 4 episodes after the reading activity?
		Do you think that your child has gained interest in reading after the reading activity?

parents how frequently (often, sometimes, seldom, never) they applied a certain guiding behavior. The Cronbach's reliability (alpha) after adapting these question items was 0.67 indicating that the questionnaire was still adequately reliable (Nunnally, 1979). In addition, there are five questions asked about the parents' perceptions of the effectiveness of the reading activity. All items in the perceived effect dimension were presented using a five-point Likert scale, from 1 (strongly disagree) to 4 (strongly agree). The Cronbach alpha reported an internal consistency 0.78 of the dimension of perceived learning effectiveness, indicating a moderate level of reliability.

4.5. *Data analysis*

Table 2 summarizes the data collection procedure and their corresponding analyses methods in responses to the research questions that are tended to be answered.

Firstly, the activity videos were analyzed to identify the role of the parents in guiding their children to draw the storyline of the books they read. Therefore, whether the parents asked questions or provided demonstrations to guide their children were analyzed from the videos to display how the parents may interact with their children in the participatory reading activities. More specifically, this study closely looked at the actions the parents taken to guide the reading activity. There were two general actions observed including demonstration and coaching. The demonstration actions showed parents demonstrated how to draw a story plot to their children. On the contrary, the coaching actions were taken only when children needed assistance. Therefore, based on the two emerged actions, this study could then categorize the parent-child interaction patterns.

Secondly, the children and parents narrated the stories they read. The voice narrations were analyzed to understand how the parents applied the dialogic reading strategies. Therefore, this study adapted the CROWD dialogic reading framework identified by Zevenbergen and Whitehurst (2003) to analyze the voice narrations. More specifically, each utterance in the voice narrations was classified into one of the dialogic reading strategies in Table 3 to see if the parents were involved in the narrations. It should be

Table 2. The data collection and analysis corresponding to the research questions.

Questions	Data collection	Schedule	Data analysis
Q1	Activity videos of the entire activity interactions on all the 10 parent-child groups	2-hour weekly activities for 6 consecutive weeks	Categorizing the occurred interaction patterns
Q2	Voice narratives generated by the 10 parents-children via the iPad storytelling application	2-hour weekly activities for 6 consecutive weeks	Coding and categorizing the dialogic reading strategies based on CROWD
Q3	The questionnaire for describing parents' perceived guiding behavior	Questionnaires administered immediately after the last week activity	Descriptive statistics of parents' feedback to the questionnaire
Q4	The questionnaire for describing parents' perceived effectiveness of the reading activity	Questionnaires administered immediately after the last week activity	Descriptive statistics of parents' feedback to the questionnaire

noted that the open-ended and wh- prompts in this framework were merged as the inquiry strategy because both of these two prompts were to ask children questions regarding specific events in the story. In addition, the parents may ask children to directly follow their narrations and confirm the understanding during the storytelling, as some of the participants of this study were pre-literate children. Therefore, the strategies of repetition and confirmation in the voice narrations were also included in the analysis.

Thirdly, the parents' feedback to the guiding behavior questionnaire was counted as frequencies to explain how the parents' perceptions toward their guiding behaviors facilitated the participatory reading activity. Finally, how the parents perceived the effectiveness of the reading activities was reported using descriptive statistics based on their feedback to the perceived effectiveness questionnaire. Although this is only a small scale study, it investigated the parent-child interaction by using different data sources. It analyzed activity videos, voice narrations and parent feedback on a questionnaire. By using these data sources, this study was able to triangulate the influence of the participatory reading activity using e-book readers from different ways of looking at the interactions.

Table 3. The analysis framework of the dialogic reading strategies.

Strategy	Purpose	Example
Completion	Asking children to fill in the blanks in parent's questions	Parent: The little mouse interrupted the lion's nap. Therefore, the lion was very _____. Child: Angry
Confirmation	Confirming children's utterances by repeating their answers	Child: The lion is yellow. Parent: Yes, the lion is yellow.
Repetition	Encouraging children to repeat the story or a specific scenario	Parent: Say after me, a little brave mouse Child: A little brave mouse.
Recall	Instructing children to recall specific characters or scenarios	Parent: What trapped the lion? Child: The net.
Inquiry (open-ended and wh-question)	Questioning children regarding specific events in the story	Parent: What does this page tell us? Child: The mouse saved the lion.
Extension	Connecting the story to real experience	Parent: Do you have a similar experience of helping others just like the mouse in the story?

5. Results and Discussions

5.1. *Parent-child interactions*

The presented study looked closely at the interactions between the children and their parents. The collaborative storytelling on the e-book readers may have afforded a high level of flexibility for the parents to provide different levels of scaffolding. Since the children might have had different experiences of reading and storytelling, it was found that the parents of this study adopted three main interaction patterns to help their children to read and tell the stories. Table 4 illustrates the interaction patterns and dialogic reading strategies applied during the collaborative storytelling activity. The three patterns are detailed as follows:

● Demonstrative interaction pattern: Three parents demonstrated such an interaction pattern. After the children read a story, the parents asked their children questions and showed them how to draw or tell the story, and then asked their children to follow them to tell the story. The children in this pattern were not skilled in storytelling and thus needed their parents to provide specific guidance in reading and telling the stories. Group 6 and 7 demonstrated such a pattern as the children were only 5 years old.

Table 4. The interaction patterns and dialogic reading strategies applied in the collaborative storytelling activity.

Group	Total	G1	G4	G5	G6	G7	G2	G3	G8	G9	G10
Age	NA	8	5	6	5	5	6	6	4	4	3
Pattern	NA	I	I	D	D	D	C	C	C	C	C
Repetition	134	0	1	82	22	24	0	0	0	3	2
Confirmation	107	0	0	0	18	0	43	0	2	44	0
Completion	8	4	0	0	0	0	1	1	0	1	1
Recall	40	5	0	0	3	0	11	0	4	13	4
Inquiry	106	12	3	2	7	0	34	0	2	42	4
Extension	8	1	1	0	0	0	5	0	0	1	0

I: Independent; D: Demonstration; C: Coaching

- Coaching interaction pattern: Five parents showed such an interaction pattern with their children. The parents asked questions about the story to guide their children to read and draw the story, but did not provide step-by-step guidance. It is conjectured that the children could tell the story by themselves (Group 2 and Group 3) as they were 6 years old. However, for the children at age 4, the parents also provided coaching instead of demonstrations because they might not consider it necessary to ask their children to retell the whole story. Instead, they asked their children questions to help them understand the story.
- Independent interaction pattern: The parents who interacted with their children using this pattern (Group 1 and 4) did not often provide guidance to help their children read or tell the story. The children could almost retell the story they had read and the parents only asked very few questions during the activity. This might be because the child was older than others (Group 1) or had prior experience in storytelling (Group 4). The children were able to retell the story they had read.

Previous studies such as Liu and Tsai (2008), Gerber, Grund, and Grote (2008) and Schrire (2006) have indicated that interaction patterns may influence the quality of learning. Schrire (2006) further confirmed that higher-order thinking is generally associated with synergistic interaction patterns. The result of this study suggests that the participatory storytelling activity on the e-book readers may facilitate child-parent collaboration and afford a variety of forms of interaction. It was found in the above interaction patterns that the parents could provide diverse levels of scaffolding. While sketching the stories, the scaffoldings were often related to a higher level of reading strategy. More specifically, the parents provided prompts to help the children clarify the story plot and structure their stories in order to correctly summarize the stories they had read. The drawings and dialog shown in Figure 4 reveal that the parent was asking questions that helped the child to extract the key components of a story. With the demonstrative pattern, some parents demonstrated how to depict a story plot to their children and asked them to do it again. Furthermore, some parents held their children's

Parent: Okay. Where is the place in the first picture? Where? Is it in a forest or in the ocean?
Child: Forest.
Parent: OK. So should we draw the forest first? Let's draw a forest. What can we see in a forest? Maybe trees, grass, and flowers? Right?
Parent: What animals can we see in this forest?
Child: Monkey.

Figure 4. The dialog between a child and her mother during the collaborative storytelling activity.

hands and helped them to draw the objects because the e-book readers were equipped with touch screens. Such results support that the storytelling application carried by the e-book readers may support diverse levels of scaffolding that helps the children understand the story they had read.

5.2. *Dialogic strategy analysis*

To understand how the parents guided their children to read and tell a story, this study further analyzed the transcription of the voice narrations which the parents and children recorded. It was observed that several dialogic reading strategies were applied by the parents during the collaborative storytelling activity, such as repetition, confirmation, completion, recall, inquiry, and extension. For instance, the voice narration displayed in Figure 5 shows that the mother firstly asked her child a higher level of question associated with the story structure. The question asked the child to summarize the main point of the story episode. Then the parent helped the child to tell the story by applying repetition and completion strategies. The result reveals that a synergistic process of participatory reading with the e-book readers is beneficial for the parents on eliciting dialogic reading strategies to guide the activities.

Table 4 shows the frequencies of the dialogic reading strategies applied by the parents. The results indicate that the three most used strategies were repetition, confirmation, and

Parent: What is the fourth picture about? What do we want to tell? (Inquiry)
Child: Little hedgehog forgives little monkey.
Parent: Why does hedgehog forgive monkey? Does he say sorry first? (Inquiry)
Child: Yes, monkey apologizes.
Parent: Monkey is forgiven. (Repetition)
Child: Monkey is forgiven.
Parent: So everyone is ... (Completion)
Child: So everyone is very...
Parent: very happy and they play together. (Repetition)
Child: very happy and they play together!

Figure 5. An episode and its voice narration recorded by a child and her mother.

inquiry. The frequent occurrence of using repetition (134 times) and confirmation (107 times) supports that collaborative storytelling activities require parents' extensive interaction with their children. In addition, the parents also questioned their children regarding specific events in the story in order to keep track of the children's progress. Inquiries were made a total of 106 times by the ten parents.

It should be noted in Table 4 that the application of dialogic reading strategies is related to the parent-child interaction patterns. The parents who interacted using more demonstrative patterns also applied the repetition strategy more frequently, but only applied other strategies very few times. On the contrary, the parents who interacted with their children using the coaching and independent patterns applied confirmation, recall and inquiry strategies much more frequently than other strategies.

Previous studies have confirmed that the provision of such structural guidance can enhance children's awareness of the story structure and thus can enhance story comprehension (Liu, Chen, et al., 2011; Rumelhart, 1975). The result of this study indicates that the most used strategies by the parents were repetition, confirmation and inquiry. The collaborative storytelling activity with sketching on the e-book readers might have informed the parents to provide different levels of guidance. In particular, the parents helped their children structure and summarize the story they read during the collaborative storytelling activity. Given the mission to collaboratively tell a story with their children, several observed dialogic reading strategies were applied by the parents to guide their children to read. Such results support that the collaborative storytelling approach with the e-book readers is a helpful pedagogy that can be applied to enhance children's reading comprehension.

5.3. *Questionnaire results*

A questionnaire of seven items was administered to understand parents' perceptions of the application of dialogic reading strategies and guiding behaviors during the reading activity. As a result, Table 5 lists the descriptive statistics of the parents' feedback to the

Table 5. The statistics of the questionnaire of parents' perception of their applied dialogic strategies and guiding behaviors.

Items	Often	Sometimes	Seldom	Never
1. Did you ask your child to guess what would happen next?	3	6	1	0
2. Did you ask your child questions to ensure his/her comprehension of the scenario?	6	4	0	0
3. Did you and your child play roles in the story while reading and telling the story?	3	1	5	1
4. Did you repeatedly go through the story with your child to ensure his/her comprehension?	3	4	2	1
5. Did you try to guide your child to complete the story telling activity?	9	0	1	0
6. Did you try to guide your child to grasp the main points of the story?	6	4	0	0
7. Did you try to ask your child questions to link the story scenarios with real life experiences?	6	3	1	0

questionnaire associated with this regard. The results show that the parents applied several dialogic reading strategies to guide their children to read and tell stories. In particular, six parents considered that they often asked questions to confirm whether their child understood the stories (item 2). Nine parents guided their children to tell the story they had read (item 5) and six parents guided their child to extract the main points of the stories (item 6). Such results are consistent with the result of the dialogic reading strategy analysis indicating that the parents often applied confirmation, recall and inquiry strategies to help their child to read and tell the stories. The findings support that the collaborative storytelling approach is helpful in promoting parent-children reading activities.

Table 6 lists the descriptive statistics of the parents' feedback to the questionnaire associated with the learning effectiveness. It was observed that relatively more than average of the parents in this study recognized the value of the participatory reading activity. In particular, most of the parents considered that their children could summarize the story they read (item 1), and their narrative ability was also improved (item 3) after the reading activity. Such reading experience also raised their children's interest in reading (item 2). The result of item 4 also supports that this participatory approach may promote children's willingness to read with parents. All of the parents agreed that their children liked to share their stories in this reading group and read stories with them. During the reading activity, when the children were invited to tell the story they had read, all of them were willing to stand at the front to present their stories to the community. Such results support that the participatory learning approach was helpful in transforming solitary reading into a reading practice in a social context. However, they only wanted to show the story they told with the collaborative storytelling application. Such results demonstrate the influence of the participatory learning approach. More specifically, because the children produced a persistent artifact in the reading group, they were more likely to participate in the social reading activity.

This study applied both social media (i.e. the online Web 2.0 platform) and reading groups to facilitate the sharing of story reading and telling experience. The parents

Table 6. The statistics of the questionnaire of the learning effectiveness.

Items	SA	A	D	SD
1. Do you think that your child could independently summarize the story in 4 episodes after the reading activity?	4	6	0	0
2. Do you think that your child has gained interest in reading after the reading activity?	1	7	2	0
3. Do you think that your child has improved skills to narrate stories after the reading activity?	4	4	2	0
4. Do you think that your child is more willing to share his/her reading experience after the reading activity?	5	5	0	0
5. Do you think your child is more willing to participate in parent-child reading activities after the reading activity?	4	6	0	0

SA: strongly agree; A: agree; D: disagree; SD: strongly disagree

revealed that their children liked the sharing activities. Such findings are consistent with the results of the study by Liu, Liu, Wang, Chen, and Su (2012) which indicates that students can learn better when they have to collaboratively produce an embodied product. With such embodied product, they could display the results of the reading activities without the need to tell the story again to others.

6. Conclusions

As e-book readers are increasingly applied in educational contexts, issues on how the pedagogical principles can be integrated into the reading activity using these devices are becoming imperative. Therefore, developing applications of the e-book readers should also address pedagogical principles. To achieve this goal, this study proposes a participatory reading framework to promote the reading experience using the e-book readers. Such a framework addresses the integration of individual reading, collaborative learning and learner community paradigms. The application of this framework in this study highlights the role of parents in assisting children to engage in reading activities and learner communities. An evaluation was conducted to investigate the influence of the proposed framework. It was found that the activity developed with such a framework facilitated the parent-child interaction which transformed reading into a collaborative and participatory learning activity.

7. Implications of the Study

This study observed demonstrative, coaching and independent interaction patterns between the children and their parents. The three patterns may play different roles in facilitating reading. This finding may provide implications for parents or educators when applying participatory reading activities with e-book readers. The use of the demonstrative guidance mainly elicited the repetition and confirmation dialogic reading strategy, whereas a higher level of the reading reactions such as inquiry and extension may be relatively less observed. The demonstrative guidance may help those children with limited reading abilities to retell a story. On the contrary, the coaching guidance may be more helpful in facilitating higher level reading strategies for children with basic skills in reading as the parents often applied strategies such as recall and inquiry, rather than only the repetition strategy, to help their children read. While using certain patterns may result in certain guiding strategies, the collaborative reading activities should be designed appropriately to address the need of different children. For example, it is worthwhile to investigate how e-book reader software may be designed to help parents appropriate a variety of strategies based on the needs of different children.

In this study the children and parents had to complete artifacts which demonstrated the story they read. These artifacts were also needed to be made public on a shared platform where all the participants have the access to see their peers' works. It was observed that relatively more than average of the parents in this study recognized the value of such a participatory reading activity. The observation echoes the constructionists' perspective suggesting that effective learning happens in "a context

where the learner is consciously engaged in constructing a public entity" (Harel & Papert, 1991). Through the sharing of the permanent stories, the children are more likely to be deeply engaged in the social reading activity. Educators may find the constructionists' collaborative learning approaches helpful to enhance the motivation to reading. From the researcher's perspective, such a process of linking participatory reading, group artifacts, and community sharing may shape a possible approach for designing collaborative learning activities.

8.   Limitations of the Study

The results of the present study demonstrate that the collaborative storytelling approach combined with participatory learning may benefit children's reading experience. However, this study was only a small-scale investigation. In particular, this study took an interaction paradigm to investigate the interaction between the children and their parents. Because such a paradigm must analyze each utterance of the discourse, it was difficult to analyze a large number of children-parents paired groups. Consequently, the findings may not be generalized beyond this study. For example, this study found three main patterns of parent-child interactions. There might be other interaction patterns which may occur when children read with their parents. Further work needs to be undertaken with a larger sample to provide robust evidence for the above conclusions. Factors such as the parents' features, children's age, and computer literacy are needed to be considered. Moreover, since the e-book readers involved in this study were iPads, the children and parents may react differently to other e-book readers. Nevertheless, the participatory learning framework may be implemented on other e-book readers such as those with the Android platform. Thus, having acknowledged these limitations, this study should still provide a potentially feasible approach to enhancing children's reading experience.

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