

A comparative study on the effects of e-picture books and printed books on story comprehension and reading motivation among Chinese preschoolers

Zhaoqi Wu^{1,2,*}, Fadzilah Amzah¹

¹ School of Educational Studies, Universiti Sains Malaysia, Penang 11800, Malaysia

² Chongqing Preschool Education College, Wanzhou 404047, China

* Corresponding author: Zhaoqi Wu, wuzhaoqi1988@student.usm.my

ARTICLE INFO

Received: 30 August 2023

Accepted: 27 October 2023

Available online: 8 November 2023

doi: 10.59400/fls.v5i3.1954

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ABSTRACT: With the development of multimedia technology, the electronic reading method has greatly increased the enthusiasm for reading among initially less motivated children. This form of reading exhibits considerable potential, underscoring the necessity of determining the impact of employing such novel software on the emergent reading of young children in China. The aim of this research investigation is to contrast the influences of electronic books and printed book reading on story comprehension and reading motivation in Chinese five-year-olds. Preschoolers participating in this study were randomly selected from three different classrooms in a public kindergarten in Chongqing, China. These participants were again assigned to electronic and printed book reading groups according to their pretest scores. During the four-week reading intervention period, each preschooler read a picture book once a week, for a total of two books. The results indicate that the incorporation of screen-based reading for preschoolers holds promise in reducing reading fatigue and fostering interest in reading. In addition, there was a notable disparity in story comprehension levels, even though varying reading mediums were used in the two groups.

KEYWORDS: emergent reading; story comprehension; motivation; e-picture book; printed picture book

1. Introduction

Children gain multiple developmental advantages of reading, including explaining the world, enhancing communication skills, memory retention, and acquiring written language proficiency (Bus et al., 1995; Wasik et al., 2016). Hence, questions regarding preschoolers' emergent reading with different materials and strategies have been arising in recent decades. According to Mason and Allen (1986), reading consists of two integral components: namely, word recognition and text meaning. The former proceeds from the smaller to the larger unit, whereas the latter proceeds from the larger to the smaller unit. It can be seen that understanding the text of the story holds significant importance in measuring children's reading proficiency.

The specific characteristics of picture books make them especially effective for facilitating children's language learning as well as vocabulary, and gaining socialization, artistic experiences, and enjoyment (Özdemir et al., 2019). One document issued by the Chinese government (Opinions on Deepening the

Reform and Standardizing the Development of Preschool Education, 2018) emphasizes that the provision of children's books in kindergartens should meet the specific requirements of young readers and promote their reading development (Gao, 2019). However, research on the reading of picture books also indicates that children tend to focus minimally on the written words, whether they are reading independently or reading with a narrator (Evans et al., 2009; Evans and Saint-Aubin, 2005). It is therefore important that appropriate methods are used to improve the quality of picture book reading for preschoolers.

Due to the growing prevalence of digital technology, young children are more and more frequently using digital devices for reading (Liman Kaban and Karadeniz, 2021), and online picture books have provided personalized electronic reading environments for young readers. According to the 19th National Reading Survey (2022), organized and conducted by the China Press and Publication Research Institute in 2021, the exposure rate of Chinese children aged 0–8 to digital reading methods is 69.2%. This gives rise to reading habits that might be distinct from the conventional act of reading books, because of the unique capabilities of touch screens on digital devices and the various social contexts in which these devices are employed (López-Escribano et al., 2021). Electronic books for preschoolers typically consist of a blend of background narration, animation, music, and interactive educational tasks that accompany the primary storyline (Şimşek and Işıkoğlu Erdoğan, 2021). These features may increase the learning potential (Bus et al., 2015), and promote reading skills among children who are just starting to read (Chera and Wood, 2003; Flack et al., 2018; Korat et al., 2014). Motivating young children to read and encouraging their active participation in self-directed learning can be effectively achieved through digital reading (Hanafi et al., 2021). This underscores the growing need for educators of early learners to employ electronic books as a means to cultivate enthusiasm for reading among preschoolers.

Studies (Liman Kaban and Karadeniz, 2021; Richter and Courage 2017) show that children exhibit a greater inclination toward electronic picture books as opposed to printed ones. These e-picture books offer various activities such as listening to the story, highlighting text, using hotspots, and providing immediate feedback and assistance when children have difficulties, which can help pre-readers understand the story when reading with a narrator. Despite some findings, research investigating the impact of the electronic picture book medium on story comprehension of preschool children is still limited (Hoel and Tønnessen, 2019). A multitude of research has centered on exploring the impacts of reading e-picture books; however, the majority of these studies have been carried out in countries that utilize alphabetic scripts (De Jong and Bus, 2004; Korat and Segal-Drori, 2016). Therefore, the main goal of this study is to contrast the effects of e-picture books and printed books on Chinese 5-year-old preschoolers' story comprehension and reading motivation.

2. Literature review

Between birth and the age of 5, children undergo substantial brain development, during which their cognitive abilities advance at a remarkable pace (Burchinal et al., 2002), and reading activities play a crucial role in fostering children's cognitive development (Powell et al., 2010; Sim and Berthelsen, 2014). Story comprehension relies on understanding words and the incorporation of their meanings into a mental representation of the text (Perfetti and Stafura, 2014). Previous research in countries using alphabetic characters has shown that children's capacity to effectively blend meanings from pictures advances within the age of 4 to 8 years (Bornens, 1990). Their capability to draw inferences from pictures increases, and so does their proficiency in reasoning about sequences of pictures (Paris and Paris, 2003).

According to Li (2017), the age of 3 to 6 years may be a critical period for the development of

Chinese children's reading comprehension, and preschoolers all have a better understanding of explicit information than implicit information. Although they have a great development in confirming the main character and understanding the plot of the story, they may have some difficulties in simple reasoning and information integration. Liu (2011) believed that at the age of 5, children can actively pay attention to words based on word recognition and have a complete understanding of picture books based on matching the meaning of words with the main information of the picture. In addition, they are fundamentally capable of recognizing or inferring the emotions of the protagonist in a given situation. This aligns with the research of Li et al. (2006), who conducted a study on the proficiency of Chinese preschoolers to read and narrate pictures, and found that children as young as 5 years old have the cognitive abilities to comprehend picture narratives.

Chinese children between the ages of 3 and 6 commonly undergo a three-year full-time early childhood education program prior to entering formal primary school. The prevalent mode of learning in Chinese preschool classrooms involves teacher-directed instruction delivered to the entire group (Fu and Wang, 2022; Guo et al., 2023; Hu et al., 2018; Wang et al., 2023). The literacy activities in the kindergarten usually include reading storybooks and picture books, singing nursery rhymes, and playing language games. However, there are some problems in the language program of Chinese kindergartens, such as the lack of reading materials for language activities in class, children's low interest, and the lack of interaction in the activities.

Children in K3 (5–6 years old) class are expected to develop the ability to interpret the pictures and the texts according to the clues in the book and to understand the emotions conveyed by the literacy work. Hence, it is essential for preschool teachers to offer children a diverse range of reading materials to foster their curiosity and enthusiasm for reading. However, there are some problems in the language program of Chinese kindergartens, such as the lack of reading materials for language activities in class, children's low interest, and the lack of interaction in activities (Ma, 2021). Moreover, studies on picture book reading also show that children pay very little attention to the text, regardless of whether they read independently or with a narrator (Evans et al., 2009; Evans and Saint-Aubin, 2005). In the process of picture book reading instruction, some children cannot effectively integrate pictures and words because teachers simply let young children look at the pictures by themselves, or fix the page-turning speed of picture books. Therefore, it is important to use appropriate methods to improve the quality of young children's picture book reading.

A recent study (Chen, 2020) reveals a noteworthy positive correlation between the rate and duration of children's learning activities with new media (including e-books) and their emergent reading, word recognition, vocabulary, and story comprehension. Researchers argued that the interactive elements present in e-picture books could enhance children's enthusiasm and curiosity for reading, which could contribute to their positive engagement with digital technology (Altun, 2019; De Jong and Bus, 2004). They found that animated pictures in e-books, particularly those that are aligned with the story text, can successfully blend nonverbal cues with language, thereby supporting children's retention and comprehension of the storyline (Bus et al., 2015). The integration of written text alongside synchronized dynamic visual and audio elements has the potential to enrich the story content and assist children in forming vivid mental imagery related to the narrative (Korat, 2010). Some researchers (Savva et al., 2022) suggest that children have the ability to actively participate in the learning process by integrating their existing knowledge, personal experiences, and the utilization of digital elements. When reading an e-book, the narrator, highlighted text, and animation may support comprehension (Kayaoğlu et al., 2011).

However, Şimşek and Işıkoğlu Erdoğan (2021) conducted a study that examined the impacts of electronic, dialogic, and conventional reading on the literacy development of 56 preschool children. The qualitative data suggested that there were slight changes in the language scores of both the digital and traditional reading groups following the intervention. According to a meta-analysis conducted by Takacs et al. (2015), multimedia elements such as animated images, music, and sound effects can enhance children's understanding of stories and even improve it compared to traditional storybook reading. On the other hand, interactive elements such as hotspots, dictionaries, and games were discovered to be more of a hindrance than a benefit. Similarly, a review of experimental and quasi-experimental research examining the influence of e-books on children's language advancement revealed that e-books have moderate effects on reading comprehension. The review suggests that certain interactive features in e-books may enhance comprehension, while other features that are incongruent may hinder comprehension (Zucker et al., 2009).

There is a growing body of research indicating a reciprocal relationship between reading comprehension and motivation (Becker et al., 2010; Conradi et al., 2014; Pan, 2022; Pan et al., 2023). Preschool educators have emphasized the need for interactive learning materials that can engage and capture the attention and interest of students (Yilmaz, 2018). Recent investigations have also revealed that a lack of initial reading motivation in preschoolers hinders their early reading development. In response, educators are encouraged to incorporate visual, audio, and other multimedia elements into teaching methods, moving away from passive approaches such as verbal explanations or passive demonstrations (Cheng and Tsai, 2014; Kim and Smith, 2017). More research is therefore needed to familiarize children with the use of e-picture books and to develop the necessary strategies to encourage their motivation.

This study seeks to provide answers to these two inquiries:

- 1) RQ1: Is there a statistically significant difference between the story comprehension levels of Chinese 5-year-old preschoolers exposed to e-picture book reading, and of those exposed to printed book reading with a narrator?
- 2) RQ2: Is there a statistically significant difference between the reading motivation levels of Chinese 5-year-old preschoolers exposed to e-picture book reading and of those exposed to printed book reading with a narrator?

3. Method

To determine the effects of e-picture books on reading motivation levels and story comprehension of Chinese 5-year-old preschoolers, this study employed a quantitative approach. Within this experimental study, information was collected by conducting assessments before and after the intervention to measure story comprehension. Additionally, a 5-point Likert-type scale was employed to gauge reading motivation. The study utilized random sampling as the chosen research method. First, the researcher randomly selected 40 numbers from the 5-year-olds' number list and gave these participants the CSCTT as a pretest. First, the researcher randomly selected 40 numbers from the 5-year-olds' number list and gave these participants the CSCTT as a pretest. Then, the preschoolers were divided into an e-book group and a print book group according to their pretest scores. Over the next 4 weeks, both groups read two picture books in the same order.

The books used in this study are "A Taste of the Moon" (Michael, 1997) and "The Rainbow Flower" (Michael, 2005). The electronic versions of these picture books come from the Yila-reading app, which is extremely popular in China. Both electronic versions adopt original illustrations and include some

background sounds, animations, and interactive learning activities. **Figure 1** shows some examples of the interactive elements utilized in the e-picture books. **Figure 1a** displays the multimedia elements, such as visual animation and sound, in the picture book “Rainbow-Colored Flowers”. Readers can advance the plot of “A Taste of the Moon” by pressing the screen to move the elephant, as shown in **Figure 1b**.

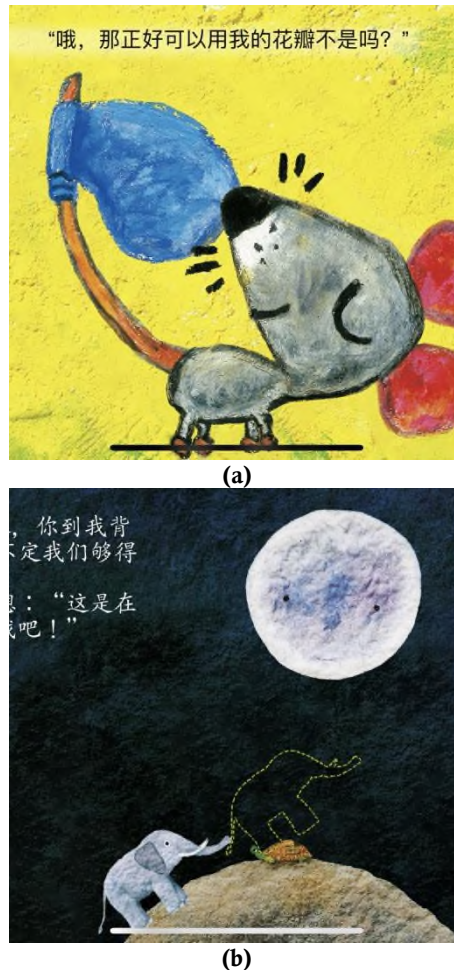


Figure 1. (a) multimedia elements; (b) hidden hotspots.

3.1. Participants

The study was carried out involving Chinese 5-year-old preschoolers ($N = 40$) of a kindergarten in Chongqing, China, during the academic year 2022–2023. The research location is a public kindergarten called Tiansheng Kindergarten, which was chosen because it served families in the middle and lower socioeconomic areas of the city, in order to reduce the potential impact of shared reading and e-picture book reading at home. The children included 16 boys and 24 girls. The average age of the children in the sample was 66.5 months.

Before conducting the research in Tiansheng Kindergarten, permission was obtained from the principal. Then, the researcher obtained informed consent from the participants’ parents before implementing the study. All parents volunteered their children to participate in the program. Additionally, the researcher used simple sentences to explain the purpose and procedures of this study to the preschoolers before the experiment. Those children whose parents granted permission were also asked verbally for their consent to participate. Ethical considerations regarding the confidentiality of the

children’s responses were strictly adhered to.

3.2. Instruments

3.2.1. Reading comprehension tests

The Children’s Story Comprehension Test Task (CSCTT), adapted from the Narrative Comprehension of Picture Books task (NC task) (Paris and Paris, 2003), is used to measure preschoolers’ picture book comprehension. In this task, the child is asked 10 specific questions which are designed according to the content of the picture book used in each intervention. According to the accuracy of the children’s answers, each item will be scored as 0, 1, or 2, with a full score of 20 points. This test was used to measure children’s reading comprehension ability in the e-picture book group and the printed book group. The test has been shown to be highly reliable, with three studies indicating substantial concurrent and predictive validity between assessments of children’s early reading abilities and the NC assessment. This indicates that the NC assessment is a credible quantitative tool for gauging the comprehension of young children, which can identify developmental changes and can be used with a variety of books (Paris & Paris, 2003). Cronbach’s alpha value obtained for CSCTT from the pilot study was 0.757, which indicated the test reached good reliability.

3.2.2. Reading motivation questionnaire

A reading motivation questionnaire following a 5-point Likert-type, designed by An (2018) is employed to assess the preschoolers’ reading motivation after the picture book reading intervention to ascertain whether there existed a notable difference in the motivation levels between the printed book group and e-picture book group. After the preschoolers completed the CSCTT, the researchers said that they would have to answer questions about the books they had read. We also emphasized that there were no right or wrong answers to these questions. Subsequently, the researchers asked the preschoolers to rate four items on a scale ranging from 1 to 5, which included factors such as interest, attitude, communication, and fatigue (as shown in **Table 1**). Cronbach’s alpha was employed to assess the internal consistency of the questionnaire, yielding a value of $\alpha = 0.81$.

Table 1. The motivation for reading questionnaire.

Item	Meaning of scale				
	1	2	3	4	5
1. Do you find the story you just heard interesting? (interest)	Very boring	Boring	Have no idea	Interesting	Very interesting
2. Would you like this reading method? (attitude)	Very dislike	Dislike	Have no idea	Like	Very much
3. Would you like to use this tool to listen to stories with your parents or other friends? (communication)	Very dislike	Dislike	Have no idea	Like	Very much
4. Do you feel tired after listening to this story? (fatigue)	Very tired	Tried	Have no idea	Relaxed	Very relaxed

3.3. Research procedure

In order to ascertain the suitability of the test for the participants’ level and to evaluate the instruments’ reliability, a trial version of the test was piloted in a different K2 class of the same kindergarten, which consisted of 20 preschoolers. Following the conclusion of the pilot phase, the formal study was conducted with two experimental groups. The pretest was the CSCTT which lasted

about 7 min. After the data are calculated, the test scores will be arranged from low to high. The children were ranked according to their pretest scores, and adjacent ranks were divided into pairs of similar reading abilities (resulting in 20 pairs). From these pairs, each member was randomly assigned to either the print book or the e-book reading group. After the pretest was completed and the groups were formed, both groups received the same intervention. They read two picture books (“A Taste of the Moon” and “The Rainbow Flower”) in the same order, with one group reading the print versions and the other using the e-book versions within a reading app. Upon the conclusion of the 4-week intervention period, preschoolers took CSCTT as the post-test and reading motivation questionnaire. Permission was obtained from the principal of this kindergarten before conducting research in the kindergarten. Besides, since the participants were under the age of 7, the researcher sought informed consent from the participants’ parents prior to the implementation of the study.

4. Results

The data gathered from each instrument was structured into tables and subjected to statistical analysis utilizing SPSS version 25.0 for the Windows platform.

Quantitative data was collected for this study from pre- and post-test scores of the CSCTT (Children’s Story Comprehension Test Task) and scores from a reading motivation questionnaire. The information obtained from each tool was organized into tables and subjected to statistical analysis utilizing SPSS version 25.0 for the Windows platform. In the analysis of quantitative data, the independent samples *t*-test was used in two groups. The significance level was set at $p < 0.05$ to interpret the research data. A noteworthy distinction in reading motivation scores was noted between the two groups.

4.1. Findings about the effects of different media on preschoolers’ story comprehension

This section presents the reading comprehension performance of the two experimental groups. A comparative analysis was undertaken on between-group statistics to determine whether there was a difference in story comprehension scores attributed to the distinct reading media: E-picture book reading and printed book reading. **Table 2** displays the descriptive statistics for the story comprehension of both groups. The outcome of the independent samples *t*-test is outlined in **Table 3**.

Table 2. Post-test descriptive statistics of story comprehension from the two groups.

Group	N	Mean	Std. deviation	Std. error mean
E-picture book	20	15.4000	1.98415	0.44367
Printed book	20	13.4500	2.99956	0.67072

As shown in **Table 2**, the mean story comprehension score of post-tests was 15.40 ($SD = 1.98$) and 13.45 ($SD = 2.99$) in the e-picture book group and printed book group respectively. As presented in **Table 3**, the outcome of Levene’s Test indicated that the assumption of the equal variances was not found to be violated for the current analysis, with an *F*-value of 2.804 and a *p*-value of 0.102 ($p > 0.05$). The result of the independent samples *t*-test showed a significant distinction in story comprehension score between these two groups, with $t(38) = 2.425$ and $p = 0.020$ ($p < 0.05$) at confidence interval of 95% which ranged from 0.322 to 3.57. Hence, the difference ranges (on this level of confidence) between 0.3 and 3.6 points of 20. That means although the results are statistically significant, the effect size ranges between 2 and 17 % of the score. This implies that the preschoolers’ ability to story comprehension in the e-picture book group and printed book group was not equal. The participants who engaged in

e-picture book reading exhibited higher scores ($M = 15.40$) in comparison to those who were exposed to printed book reading ($M = 13.45$).

Table 3. Independent samples *t*-test for the post-test of story comprehension.

		Levene's test for equality of variances		T-test for equality of means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% confidence interval of the difference	
									Lower	Upper
Post-test	Equal variances assumed	2.804	0.102	2.425	38	0.020	1.95000	0.80418	-0.32202	13.57798
	Equal variances not assumed	-	-	2.425	32.955	0.021	1.95000	0.80418	-0.31379	13.58621

4.2. Findings about the effects of different media on preschoolers' reading motivation

A comparative analysis was carried out, and the statistical data for different groups were organized to determine if there were variations in reading motivation scores attributed to the use of different reading media. The assessment of reading motivation measurement consistency among the groups can be seen in **Table 4**.

Table 4. descriptive statistics of reading motivation from the two groups.

Item	Group	N	Mean	Std. deviation	Std. error mean
Interest	E-picture book	20	4.25	0.716	0.160
	Printed book	20	3.85	0.670	0.150
Attitude	E-picture book	20	4.80	0.410	0.091
	Printed book	20	4.05	0.759	0.169
Communication	E-picture book	20	4.25	0.638	0.142
	Printed book	20	3.95	0.686	0.153
Fatigue	E-picture book	20	4.70	0.470	0.105
	Printed book	20	4.00	0.794	0.177
Total score	E-picture book	20	18.00	1.213	0.271
	Printed book	20	15.85	1.755	0.392

As shown in **Table 5**, the outcome of Levene's Test suggested that the assumption of the equal variances for the total score was not found to be violated for the present analysis, $F = 3.141$, $p = 0.084$ ($p > 0.05$). The outcome of the independent samples t-test revealed a notable disparity in reading motivation (total score) between these two groups, with $t(38) = 4.505$ and $p = 0.00$ ($p < 0.05$) at confidence interval of 95% which ranged from 1.183 to 3.116. This means that the preschoolers' reading motivation levels were not the same in the e-picture book group and printed book group. Scores for some factors of reading motivation differ significantly between the two groups. The participants who received the e-picture book treatment had higher attitude scores ($M = 4.80$) compared to those who were exposed to printed books ($M = 4.05$). Additionally, when comparing fatigue scores, participants who engaged in e-picture book reading had higher scores ($M = 4.70$) than those who received printed book treatment ($M = 4.00$). According to the Motivation for Reading Questionnaire, high fatigue scores actually mean that the readers don't find the reading tiring. In other words, the children in the e-picture

book group experienced lower levels of reading fatigue at the end of the 4-week intervention. The result of the independent samples t-test indicated that there were significant differences in attitude and fatigue scores between these two groups, with $t(38) = 3.887$ and $p = 0.000$ ($p < 0.05$) and $t(38) = 3.390$ and $p = 0.002$ ($p < 0.05$) respectively.

Table 5. Independent samples t-test of reading motivation from the two groups.

		Levene's test for equality of variances		T-test for equality of means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% confidence interval of the difference		
										Lower	Upper
Interest	Equal variances assumed	0.522	0.474	1.823	38	0.076	1.95000	0.40000	-0.04425	1.84425	
	Equal variances not assumed	-	-	1.823	37.837	0.076	1.95000	0.40000	-0.04431	1.84431	
Attitude	Equal variances assumed	4.238	0.46	3.887	38	0.000	0.75000	0.19297	0.35936	1.14054	
	Equal variances not assumed	-	-	3.887	29.231	0.001	0.75000	0.19297	0.35547	1.14453	
Communication	Equal variances assumed	0.142	0.708	1.431	38	0.161	0.30000	0.20964	-0.12439	0.72439	
	Equal variances not assumed	-	-	1.431	37.805	0.161	0.30000	0.20964	-0.12446	0.72445	
Fatigue	Equal variances assumed	2.250	0.142	3.390	38	0.002	0.70000	0.20647	0.28201	1.11799	
	Equal variances not assumed	-	-	3.390	30.849	0.002	0.70000	0.20647	0.27881	1.12119	
Total score	Equal variances assumed	3.141	0.084	4.505	38	0.000	2.15000	0.47725	1.18387	3.11613	
	Equal variances not assumed	-	-	4.505	33.790	0.000	2.15000	0.47725	1.17990	3.12010	

5. Discussion

The objective of this study was to grasp the consequences of various reading forms (e-picture books and printed books) on the story comprehension and reading motivation levels of Chinese 5-year-old preschoolers.

Discussion of the findings of RQ1: Is there a statistically significant difference between the story comprehension levels of Chinese 5-year-old preschoolers who are exposed to e-picture book reading, and printed book reading with a narrator?

The present study sought to compare the levels of story comprehension among preschoolers in the two reading groups. Half of these 5-year-old preschoolers read two picture books digitally and the other half read the same books in printed format. The data that was gathered and analyzed aimed to explore how different types of reading media affect story comprehension scores. The results indicated that the participants achieved significantly higher scores on assessments when they read digital text. These findings align with previous studies that also observed variations in the impact of different media on preschoolers' emergent reading skills (De Jong and Bus, 2004; Hu and Wang, 2023; Takacs et al., 2015;

Wang and Hemchua, 2022; Zucker et al., 2009). They concluded that both formats, interactive e-books, encompass various modes of information presentation, including written text, oral narration, illustrations, and touch-activated that trigger animations and sound could potentially enrich the story's substance and aid in fostering the mental imagery of the narrative for preschoolers (Rvachew et al., 2017). Besides, a review of experimental and quasi-experimental research investigating the influence of e-books on children's literacy advancement revealed that e-books have moderate effects on reading comprehension (Zucker et al., 2009). Studies have found that multimedia books with some interactive features and edutainment characteristics would attract young readers' attention and promote their engagement in the reading process (Altun, 2018; Takacs and Bus, 2016). The animations in these e-books provide additional visual details, which may enhance the connection between illustrations and text. Children are simultaneously exposed to both forms of information, which could contribute to their overall understanding of the story (Altun, 2022).

Discussion of the findings of RQ2: Is there a statistically significant difference between the reading motivation levels of Chinese 5-year-old preschoolers who are exposed to e-picture book reading, and printed book reading with a narrator?

The second research question aimed to examine how reading e-picture books affects the levels of reading motivation among Chinese five-year-old preschoolers. This investigation included several factors such as interest, attitude, communication, and fatigue. The quantitative results revealed a significant disparity in motivation scores between the e-picture book and printed book groups. Specifically, the introduction of digital reading intervention yielded a favorable impact on the reading motivation of the preschoolers engaged in the e-picture book reading group. Judgments on attitude and fatigue seem to be quite effective in measuring the engagement of participants and their reading experiences with digital texts, and there exists some evidence that lends support to these findings.

Some research shows that electronic pictures or storybooks increase learning potential (Bus et al., 2015), yielding favorable learning outcomes for children, including improvements in expressive language and attention (Niklas et al., 2016; Zipke, 2017). That is because interactive features in e-picture books can boost children's enthusiasm and curiosity for reading, leading to increased reading time and ultimately enhancing their future reading skills and achievements (Liman Kaban and Karadeniz, 2021). According to Kaynar et al. (2020), the utilization of e-books during early childhood led to heightened interest in reading and enhanced reading skills among preschoolers. Since attitude and interest in reading encompass an individual's emotions toward the activity, they are considered significant motivational components (Altun, 2019). Regarding communication, a subfactor of reading motivation, despite the absence of a notable distinction between the e-picture book and the printed book group in this study, there is some evidence that this collaborative e-reading practice led to reciprocal intrinsic motivation among both children and their parents (Kaynar et al., 2020; Zhi et al., 2023). Moreover, there is a growing body of evidence highlighting the bidirectional links between reading motivation and comprehension. E-picture books with animation and vivid illustrations to capture young readers both visually and through auditory elements (Kayaoğlu et al., 2011) can have a direct impact on children's story comprehension. Thus, considerate e-books and the correct presentation of these books should be provided throughout the emergent language instruction in the preschool.

6. Limitations of the study

Despite the utilization of carefully designed e-picture books for Chinese preschoolers in the study, there were several limitations. Firstly, the findings of the preschoolers might be less generalizable due to

the population, and sample size. Due to the time limitations and a restricted budget, the population was selected in a practical manner, and it was only limited to more than a hundred 5-year-old preschoolers from a public kindergarten in Chongqing, China. Since instrument development is a step-by-step process that often involves multiple iterations to achieve desirable item qualities, the sample size of the two groups was limited by platform and time constraints. Only 40 participants were selected by using random sampling. Therefore, it is advisable to replicate a similar study with more extensive participant groups.

In addition, the majority of the preschoolers in this study had not previously encountered e-picture books. The novelty effects of the e-picture books might have impacted how engaged and attentive the experimental group was during the study. Furthermore, the book-reading sessions were conducted as an individual reading activity. But previous study (Altun, 2018) demonstrated that engaging in e-book reading activities within small groups can contribute to the enhancement of children's language and literacy skills. Therefore, future research could explore and contrast the effectiveness of e-picture books in small-group settings versus whole-group or one-to-one sessions. Finally, the two groups were aligned according to their initial story comprehension scores. However, individual variances among preschoolers, such as foundational language skills and temperament, could impact their experiences during picture book reading. It is expected that future research will examine various language skills and affective factors together in order to develop a more effective pretest instrument that accounts for individual differences.

7. Conclusions

With the implementation of digital technologies, the nature of reading is changing at a rapid pace and e-picture book reading has evolved into a more inherent environment for young children. Studies indicate that touch screen devices are becoming increasingly common in households with preschool children and that parents view technology positively as a tool to enhance their children's independent reading skills and enjoyment (Korat and Segal-Drori, 2016). The diverse findings about investigating the influence of e-picture book reading on emergent reading skills are a notable concern for researchers, educators, and e-storybook designers. The findings of the current study indicated that employing e-picture books could be regarded as an efficient instructional approach for enhancing the development of Chinese 5-year-old preschoolers' story comprehension. Besides, the results also proved that e-picture books could improve participants' interest, recognition, and communication feelings about reading, while effectively reducing fatigue. By identifying the effective factors of e-picture books on emergent reading, preschool teachers and parents can prepare their instructional e-picture book materials to teach the children so that they can enjoy reading efficiently and increase the success of emergent achievement. Moreover, this study provides valuable insights into the possibility of implementing e-picture book reading approaches in Chinese preschools. This aligns with the goals of China's Education Modernization 2035 addresses the requirements of the technological era.

Author contributions

Conceptualization, ZW and FA; methodology, ZW; validation, ZW and FA; formal analysis, ZW; investigation, ZW; data curation, ZW; writing—original draft preparation, ZW; writing—review and editing, ZW and FA; supervision, FA. All authors have read and agreed to the published version of the manuscript.

Acknowledgments

This work was supported by the School of Educational Studies, Universiti Sains Malaysia, and Chongqing Preschool Education College.

Conflict of interest

The authors declare no conflict of interest.

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