The Complex Effects of Picturebooks on English as a Foreign Language Reading

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ABSTRACT

While effects of picturebooks on reading were examined in higher grades (e.g., high school students) (Ajayi, 2009), little is known about the emerging English as Foreign Language (EFL) Kindergartens to 4th graders (i.e., K-4) students in China. Language institutes are critical phenomena for EFL K-4 education in China (Shi, 2019). Aiming to test the hypothesis that picturebooks have positive effects for reading, this study adopted within-subjects and between-subjects design to examine the effects of picturebooks on EFL reading comprehension of K-4 students in a language institute in China. Thirty-two participants were assigned into two groups to complete multiple choice and ordering tasks. The results showed that students reading with picturebooks outperformed in the two tasks than those who did not, especially on answering literal questions. With pedagogical implication as a goal, we suggest that EFL teachers need to (1) provide scaffoldings in class such as activating students' prior knowledge, (2) make connections to students' experience in the reading process. (3) select picturebooks considering the complex relationship between pictures and texts.

Key words: Picturebooks; Reading Comprehension; EFL Learners; China

INTRODUCTION

EFL education is currently a compulsory requirement in all levels of education in China. In China, there are more than 400 million EFL learners (Wei & Su, 2012). In particular, K-4 EFL education becomes a heated field in public K-12 education. This is because all Chinese public-school students are required to learn English from the third grade (Wei & Su, 2012). A majority of Chinese children in developed cities start learning English in kindergartens (Jin et al., 2017). Maybe even before that, the Chinese aspiring parents have already sent their children to online educational programs, local after-school training centers to start their EFL learning as early as possible.

Language institutes are critical phenomena for EFL K-4 education in China (Shi, 2019). Language institutions emphasize on selecting the most valuable teaching materials to attract more learners in competition with other institutes (Shi, 2019). Therefore, a variety of well-designed curriculum and high-quality learning materials are used in language institutions such as picturebooks, dramas, cartoons etc. Among these teaching materials, picturebooks are gaining a lot of attentions recently in K-4 EFL class in China. A number of researchers have looked at the effects of using picturebooks in EFL class. For instance, EFL learners were found to gain increased enjoyment in reading (Aguirre-Muñoz & Pantoya, 2016; Birketveit & Rimmerieide, 2017), and experience language practices in reading and writing (Sheu, 2008; Wang & Lin, 2019). However, most current studies are conducted among participants aging above ten years old. A dearth of research examines picturebooks' effects on K-4 EFL learners' reading development, let alone students' reading skills in specific aspects.

While effects of picturebooks on reading were examined in higher grades (e.g., high school students) (Ajayi, 2009), little is known about the emerging EFL K-4 students in China. In order to better understand this issue, our study examines the effects of picturebooks on reading comprehension using measures of multiple choice tasks and ordering tasks, which were proven to be helpful reading assessments for coping with cognitive overload, as an important factor in reading comprehension (Hou, 2006; Huang, 2019). Besides, since there are several reading skills in reading comprehension, including literal comprehension, reorganization of the ideas, inferential ability, evaluation skills, and appreciation development (Alderson & Urquhart, 1984)), it is necessary to explore visual effects on these different reading skills respectively.

Aiming to test the hypothesis that picturebooks have positive effects for reading, this study adopted within-subjects and between-subjects design to examine the effects of picturebooks on EFL reading comprehension of K-4 students, who are EFL learners in a language institute in China.

The goal of our study is to provide specific classroom implications for teachers to use picturebooks (i.e., which reading skill to focus on by using picturebooks) in K-4 EFL class efficiently. By conducting quasi-experimental study, we run paired sample t-tests and independent t-tests to identify the effects of picturebooks on students' reading comprehension. We will also provide pedagogical implications on how to use picturebooks to promote K-4 EFL learners' reading skills in multiple aspects.

The purpose of this study is to answer the following research questions:

1) In the within-subjects and between-subjects design, do students reading picturebooks outperform in multiple choice tasks and ordering tasks in reading comprehension than those who do not?
2) In the within-subjects and between-subjects design, do students reading picturebooks outperform in answering literal questions, gist questions and inferential questions in reading comprehensions than those who do not?

LITERATURE REVIEW

This study investigates the effects ofpicturebooks on EFL reading in a K-4 context in China. The literature review first states the significance of reading in K-4 EFL education. Then, we discuss why we focus on picturebooks in this study.

Reading Comprehension in EFL Education

Reading comprehension is an essential practice in education. Similarly, in EFL education, especially in private English courses in language institutes, reading is considered as a complicated cognitive information process that involves both the reader and reading materials (Mohammadian et al., 2018). Some language institutes categorize students into multiple classes according to their reading levels. There are several ways to assess students' reading levels, including Guided Reading Level (GRL), Developmental Reading Assessment (DRA), and Lexile Measures (Menzies et al., 2008). Institutes select the assessment according to their teaching goals and accessibilities to teaching materials. Current reading research has shown that several factors contribute to the comprehension of the information, including learners' prior knowledge (Al-Jahwari & Al-Humaidi, 2015; Alptekin & Erçetin, 2011; Kobayashi, 2009), learning style preferences (Li & He, 2016), and instructional and cognitive strategies (Carrillo, 2010; Echeverri & McNulty, 2010; Roohani, 2015).

In order to have a comprehensive understanding of students' reading skills, researchers usually assess students' reading skills from completing two common tasks in reading comprehension: multiple tasks (e.g., Huang, 2019; Hou, 2016) and ordering tasks (Razi, 2005). These two tasks evaluate students' reading comprehension in specific aspects: literal comprehension, reorganization of the ideas, inferential ability, evaluation, and appreciation (Alderson, & Urquhart, 1984). It is important to measure how picturebooks can help K-4 learners in different aspects, thus providing pedagogical implications for teachers to offer concrete

support in each reading skill specifically (Roozafzi, 2012). Therefore, our study will focus on the effects of picturebooks on specific reading skills among young EFL learners, especially on answering literal questions, gist questions, and inferential questions.

Moreover, most of the aforementioned research on EFL learners' reading comprehension were conducted in middle and high schools or higher education. Few studies have been conducted in K-4 EFL education. We emphasized on K-4 context, which is a significant stage in current EFL education in China (Jin et al., 2017).

Picturebooks and K-4 EFL Education

As the complimentary reading materials in EFL education in China, picturebooks have gained a lot of attentions for the past decade (Sheu, 2009). Picturebooks are defined as "an item of manufacture and a commercial product; a social, cultural, historic document; and foremost, an experience for a reader" (Bader, 1976, p. 1). Bland and Lütge (2013; 2014) considered picturebooks as multilayered literature that creates narrative through "written language, visual image, and graphic design" (p. 16). The visual aid enables each layer to deliver meanings in different ways. The combinations of text, images, and dynamic layouts collaboratively contribute to the whole narrative.

However, it remains controversial how visual aids in picturebooks affect young EFL learners' reading comprehensions in K-4 contexts. Sheu (2008; 2009) argued that pictures stimulate EFL learners' imagination by creating more space for interpretation of the information, which further develops their creativity. Meanwhile, Yang (2015) contended that EFL learners encounter challenges in reading images in picturebooks. For example, participants were found puzzled when reading pictures that have conflicts with their prior knowledge, which confused them in interpreting the message. Teachers also found it taking more time and effort for intensive reading when the pictures are abstract and not easy to interpret for young EFL learners. The aforementioned studies are all from qualitative research where researchers gain participants' insights of picturebooks' visual aids, which creates space for us to evaluate the effects of picturebooks by implementing quantitative methods in our study.

The influence of picturebooks in specific reading skills on young EFL learners has also been discussed in some research, which provides us with suggestions and other chances to explore in our study. For instance, Kolb (2013) argued that students' reading comprehension was fostered by using several reading strategies such as "guessing from context" and "reading for gist" (p. 38). Such strategies shed lights on the gist questions in the reading comprehension tasks in our study. Besides gist questions, literal questions attracted researchers' attentions as well. Since the mastery of vocabulary is one element in answering literal questions, Hashemifardnia (2018) measured the effects of teaching picturebooks on elementary EFL learners' vocabulary learning by conducting a quasi-experimental study in Iran. Nevertheless, the study used word list picturebooks in which each word has the corresponding picture, which did not create a narrative context,

compared to the picturebooks with narrative plots. Our study will thus fulfill the gap by using picturebooks with story plots and examine young EFL learners' performances in answering three types of questions, literal questions, gist questions, and inferential questions. By looking at the effects of picturebooks in the development of students' different reading skills, this study will give pedagogical implications for EFL teachers to use picturebooks efficiently.

THEORETICAL FRAMEWORK

Two theories are used as our theoretical framework, Dual Coding Theory (DCT) and multimodality theory. As is discussed above, picturebooks are the integration of both images, texts, and design. In order to better understand the visual effects of picturebooks, we use two theories to help us understand the roles of images playing in reading. DCT stands from cognitive perspective of reading texts and images simultaneously. Multimodality theory illustrates how multiple modes convey meanings collaboratively. The two theories together work well in explaining the effects of picturebooks on EFL learners' reading comprehension.

Dual Coding Theory

DCT contends that human experience cognitive activities through two separate systems when reading. One system is specialized for language, in which the basic units are called logogens (Sadoski & Krasny, 2019; Sadoski & Paivio, 2013). The other system is specialized for nonverbal objects, where the basic units are named as imagens. People understand information from both logogens in verbal systems and imagens in nonverbal systems (Sadoski & Krasny, 2019). These two systems work differently in processing. The organization in the verbal system is sequential while that in the non-verbal system is nonsequential. In other words, logogens are listed in sequence. People read among letters, words, phrases, and sentences. Meanwhile, imagens are spacial. Readers might get much information just by one glance of a photo. There are three levels of processing in DCT, which are representational, referential, and associative. These levels are defined as "the activation of those mental representations and the connections between them" (Sadoski & Paivio, 2013, p. 41).

Representational processing involves the direct activation of mental presentations by texts. Referential processing is an indirect activation where representations in one system are activated by representations in the other system. Associative processing entails another indirect activation within the same verbal or nonverbal system. In our case, students read both logogens and imagens at the same time when reading picturebooks. Using DCT helps us to explain the visual aid of picturebooks from readers' cognitive activities.

A large body of research used DCT as a theoretical framework to analyze effects of visualization in foreign language learning such as vocabulary acquisition (e.g., Shalmani, 2010) and reading comprehension (e.g., Huang, 2019; Roohani et al., 2015). Researchers applied DCT in various learning contexts including comic book reading (Roozafzai, 2012), multimedia-based learning (Karbalaei & Zare, 2019; Torabian

& Tajadini, 2017), and picturebooks reading (Hashemifardnia et al., 2018). Nevertheless, participants in these studies are either teenagers or adults. Few studies discussed the visualized learning experience of young EFL learners especially among elementary school students. Our study will fill in the gap by using DCT in K-4 EFL context in China.

Multimodality Theory

Multimodality theory, as a semiotic approach, explains how people communicate in different modes, including texts, images, sound, gestures, and so on (Kress, 2010). The theory focuses on distinct affordances of various modes, and how different modes collaboratively function in the meaning-making process (Kress, 2013).

For the past decade, the concept of multimodality has been expanded to the field of education and literacy development (Bazalgette & Buckingham, 2012). Multimodality allows us to consider reading as a process of decoding both verbal and nonverbal information to a development on learners reading comprehension. Bezemer and Kress (2008) examined the relationship between images and texts in school textbooks, contending that multimodal representations of knowledge create learning environment that facilitates learning. Researchers also zoomed into multimodal readers' responses such as how they attend to visual and design system of meaning (Huang & Lammers, 2018; Young, 2012), how they interpret multimodal texts in picturebooks (Callow, 2018), and how they deliver meaning through multimodal practices such as creating posters and advertisement (Ajayi, 2009). Picturebooks, as the typical representative of multimodal teaching materials that contain both image, texts, and design, enable us to apply multimodality theory to explain how a variety of modes help EFL learners to read with a focus on reading *process*.

DCT and Multimodality Theory in Present Study

DCT and multimodality theory together offer us a comprehensive framework to situate the values and perspectives in our design of this study. DCT and multimodality allow us to consider reading as a *process* of decoding both verbal and nonverbal information to a development on learners' reading comprehension. From individual's cognitive development, dual coding theory elucidates how people interpret meaning from both visual and verbal systems. From the semiotics approach, multimodality theory articulates functions of multiple modes and how they collaboratively convey information effectively. The two perspectives help us to articulate the importance of analyzing the effects of picturebooks from both the aspects of young EFL learners and visual design in picturebooks.

METHODS

Participants

Thirty-two participants were recruited from an English learning institution in Suzhou, China in 2017. All participants

were all EFL learners who speak Chinese at home and learn English as a foreign language at school. The institution assesses students' reading level based on DRA, as one common reading assessment that has been discussed above. Every student receives the reading level assessment when joining in the institution and is assigned to different classes according to their performances in DRA. Since our targeted participants are K-4 children, after talking with the teachers in the institution, we thought Level 10 classes would be the most suitable classes for our study based on students' ages. Among four Level 10 classes, we chose students in two classes as our participants, one class with 19 students (Group 1), and the other class with 13 students (Group 2) considering class size, age, and course schedules. Table 1 reports the demographic information of the participants involved in the study in terms of age, gender, and years of learning English. The average age of both groups is around 8, and their years of English learning (i.e., the number of years when they started informal English learning in out-of-school venues) is around two.

Study Design

This study adopted between-subjects and within-subjects group designs to examine the impact of picturebooks on K-4 EFL learners' reading comprehension. Between-subjects design compares scores from two groups of participants with one group reading picturebooks and the other group reading the same narrative texts. Considering the possibilities that students' reading comprehension might be affected by other factors besides visual aids including book content, linguistic difficulties, etc., our study also used within-subjects design to enhance the credibility of the research. By comparing scores from two tests when the same group of participants read two picturebooks that share the similar content and language difficulties, we are able to provide valid results that interpret the effects of picturebooks on students' reading comprehension.

Multiple t-tests were used to examine the difference between participants' performance in two reading processes with and without pictures. Participants in both groups read two stories respectively with and without the pictures, and then completed multiple choice tasks and ordering tasks based on their reading comprehension.

The study lasted for two days when each group read one story each day. On the first day, Group 1 students read the picturebook Story 1 (Capucilli et al., 1997) then completed two tasks immediately. Time limit was five minutes for reading and 10 minutes for completing reading comprehension tasks. Students could refer to the reading materials (picturebooks with or without pictures) when doing the tasks. At the same time, participants in Group 2 were assigned to read Story 1 without pictures, which means that the story was presented only through narrative texts. The story was written with one sentence on each line, aligned with what is demonstrated on the picturebook. The time limit and requirement were the same as Group 1. On the second day, participants in Group 1 read Story 2 (Capucilli et al., 2002), a narrative text of the picturebook without pictures and then completed the tasks immediately. Meanwhile, students in Group 2 were

required to read the picturebook, Story 2 with pictures and complete the tasks as well. All the requirements were the same as the first day, so that we can ensure that students in both groups followed the same study design.

Materials

Reading materials

The two stories *Biscuit Finds a Friend* (Story 1), *Biscuit Goes to School* (Story 2), were chosen from one of the most popular series in *I Can Read* picturebooks: *Biscuit*. Biscuit is a yellow puppy who is personified in the book. This choice of reading material was based on participants' reading level according to DRA and was identified as appropriate reading texts for Level 10 readers. In order to eliminate the impact of linguistic factors on the effects of picturebooks on students' reading comprehension, the difficulties of texts of two books were evaluated with respect to word length, average number of words in a sentence, and total number of words in the book (Lado, 2012). Table 2 demonstrates three variables in both picturebooks, showing that both reading materials share the similar readability measures. In order to ensure inter-rater reliability, both researchers rated the two reading materials and agreed that these two stories have similar levels of reading difficulties.

Besides readability in terms of language difficulties, the contents of both picturebooks are suitable for K-4 EFL learners as well. Story 1 illustrates the procedure of how Biscuit meets a duck on the road and makes friends with the duck. Story 2 narrates the activities that Biscuit does when he goes to school. Both stories are situated in the contexts where children are familiar with. The animal characters are also one of the young EFL learners' favorites, which can motivate them in reading (Lado, 2012).

Reading comprehension tasks

The reading comprehension tasks are divided into two sub-tasks: multiple choice and ordering (Appendix A and Appendix B). Each part is scored 100. In multiple choice tasks, both questions and choices are written in Chinese (participants' mother tongue) for the convenience of participants. There were

Table 1. Participants' demographic information

Group Number	Number of Students		Age M	Years of English learning M
	Male	**Female**		
Group 1	10	9	8.31	2
Group 2	4	9	7.92	1.8

Table 2. Variables of readabilities in two picturebooks

	Word length M	Words in a sentence M	Total number of words in the book
Story 1	4.12	3.5	133
Story 2	4.22	3.28	108

ten items of multiple choice for each story, including literal questions (n=4), gist questions (n=3) and inferential questions (n=3). Each item had four choices. In order to keep alignment between two reading comprehension tasks for Story 1 and Story 2, the sequence of different questions remained the same as well. Table 3 shows the summary of these three question types with definition and examples in the study.

The second part of reading comprehension is ordering task. Participants were asked to put the scrambled sentences into correct order according to the story. Ordering tasks aim to test students' ability to deal with cohesion and text organization (Razi, 2005). In both tests, there were five sentences in the ordering task. The sentences were directly chosen from the texts in picturebooks and represented key plots of the stories. To complete ordering tasks, students need to have an overview of the text, and meanwhile have a clear idea of how the story is developed.

RESULTS

Organized by the two research questions, this section reports the results of the study. Results from both within and between group designs help us to see the overall positive effects of picturebooks on EFL learners' reading comprehension.

Research Question 1

In order to answer the RQ 1 (In the within-subjects and between-subjects designs, do students reading picturebooks outperform in multiple choice (MT) tasks and ordering tasks (OT) in reading comprehension than those who do not?), we conducted both paired-samples t-test and independent-sample t-test to determine whether there was a statistically significant mean difference between the scores of two tasks respectively with and without pictures.

The full score of each task is 100. In a paired-samples t-test, we analyzed the participants' performances within the same group (both Group 1 and Group 2) who read two different picturebooks and two correspondingly narrative texts sharing the same content. The result of a paired-samples t-test is shown in Table 4.

In group 1, participants scored higher in MT1 when reading the picturebooks (M=75.26, SD=15.41) as opposite to the participants only read narrative texts without pictures (M=53.68, SD=16.40), with a statistically high significant increase of 21.6, 95% CI [11.01-32.15], t(18)=4.290, p=0.000, p<.001. Further, Cohen's effect size value (d= 1.36) suggested a high practical significance. In terms of ordering tasks, participants gained higher scores in Story 1 when reading picturebooks (M=63.16, SD=37.61), comparing to the scores in Story 2 with only texts (M=42.11, SD=26.58). A statistically significance was also found between OT1 and OT2 in Group 1, 95% CI [3.74-38.37], t (18)=2.55, p=0.02, p<.05. A moderate practical significance (Cohen's d=0.65) was demonstrated as well. Similarly, participants in Group 2 also gained higher scores in doing ordering tasks when supported with pictures (M=55.38, SD=34.79), comparing to the score without pictures (M=38.46, SD=37.66). A statistically significance is found, p=0.045, p<.05. The effect size value is 0.47, which indicates a moderate practical significance.

Besides paired-samples t-test, an independent-sample t-test was run to determine whether there were differences in reading scores in different groups when completing multiple choice tasks and ordering tasks between students reading picturebooks and those who only read narrative texts (Table 5).

Table 3. Question types in multiple choice tasks

Question type	Definition	Example in the study
Literal question	Literal questions assess students' understanding of the straightforward meaning in the material, such as facts, vocabulary, dates and time (Liu et al., 2016)	*What does "quack" mean in the story?*
Gist question	Gist questions assess participants' understanding on the main idea of the story.	*Among all the choices, which is the best title for this story?*
Inferential question	inferential questions involve more than literal understanding but the deeper understanding of the texts (Day & Park, 2005). The answers to inferential questions are not explicitly presented in the reading material	*It can be inferred from the story that, Biscuit will…?*

Table 4. Results of the paired t-test (Within-subjects Design)

Test type	Group	*t* test	*P*	Story 1		Story 2		Effect size
				Read picturebooks	***M (SD)***	**Read picturebooks**	***M (SD)***	
MT1	1	4.29	0.00***	Yes	75.26 (15.41)	No	53.68 (16.41)	1.36
MT2	2	0.64	0.54	No	66.16 (19.95)	Yes	62.31 (9.27)	0.25
OT1	1	2.55	0.02*	Yes	63.16 (37.61)	No	42.11 (26.58)	0.65
OT2	2	-2.24	0.045*	No	38.46 (37.66)	Yes	55.38 (34.78)	0.47

*p<.05. **p<.01. ***p<.001
 No in the column of read picturebooks means that they read narrative texts

Although no statistically significant difference was found in both tasks of reading comprehension in two stories, participants all achieved higher mean scores when reading picturebooks comparing to those who read narrative texts. In Story 1, Group 1 students reading the picturebook performed better in multiple choice tasks (M=75.26, SD=15.41) and ordering tasks (M=63.15, SD=37.61) than those in Group 2 (M=66.15, SD=18.95; M=38.46, SD=37.66). In Story 2, Group 2 students who are visually aided from picturebooks achieved higher scores in both tasks (M=62.31, SD=9.27; M=55.38, SD=34.79) than those in Group 1 who only read with texts. The effect sizes all indicate a moderate practical significance, with 0.53, 0.65, 0.66, 0.43 respectively. To sum up, the results from both with-subject and between-subjects design find out that EFL learners reading picturebooks perform better in doing multiple-choice tasks and ordering tasks than those who did not.

Research Question 2

The second research question (In the within-subjects and between-subjects design, do students reading picturebooks outperform in answering literal questions, gist questions and inferential questions in reading comprehensions than those who do not?) asked particularly about the effects of picturebooks on three types of reading comprehension questions, which are literal questions (LQ), gist questions (GQ) and inferential questions (IQ). We ran paired-sample t-test and independent t-test to identify the effects with respect to three individual question types.

When we analyze the data in this section, full score of each type of question is 100. We analyzed the participants' scores within the same group (both Group 1 and Group 2). The result of a paired-samples t-test is demonstrated in Table 6.

In Group 1, participants gained higher score in Story 1 when reading the picturebooks in each question type, especially in literal questions that showed a statistical significance. In terms of literal questions, the score in Story 1 (M=83.95, SD=17.69) was much higher than that in Story 2, with an increase of 33.94. A statistically high significant difference was found, 95% CI [22.24-45.66], t (18) =6.09, p=0.00, p<.001. A large practical significance is suggested from a large effect size (d=1. 97). Meanwhile, neither gist questions nor inferential questions showed any statistical difference between two tests.

It was interesting to note that the result of participants in Group 2 showed a different result from that in Group 1. They performed better in answering literal questions when reading only with texts (M=67.31, SD=25.79), and gained lower score (M=46.15, SD=13.87) when reading picturebooks. No statistical significance was found concerning gist questions and inferential questions. We will discuss the potential factors that might contribute to the result in following paragraphs.

Apart from paired-samples t-test, an independent sample t-test was run to examine the effects of picturebooks in terms of each of these three individual question types between two groups. The scores of each types of questions in both Story 1 and Story 2 were demonstrated in Table 7.

Table 5. Results of independent t-test of MT and OT (Between-subjects Design)

Test type	Story	*t* test	*P*	Group 1		Group 2		Effect size
				Read picture books	*M (SD)*	Read Picture books	*M (SD)*	
MT1	1	1.496	0.145	Yes	75.26 (15.41)	No	66.15 (18.95)	0.53
MT2	2	1.82	0.078	No	53.68 (16.40)	Yes	62.31 (9.27)	0.65
OT1	1	-1.71	0.097	Yes	63.16 (37.61)	No	38.46 (37.66)	0.66
OT2	2	-1.22	0.23	No	42.11 (26.58)	Yes	55.38 (34.78)	0.43

*p<.05. **p<.01. ***p<.001
No in the column of read picturebooks means that they read narrative texts

Table 6. Scores of different question types (Within-subjects Design)

Question type	Group	*t* test	*P*	Story 1		Story 2		Effect size
				Read picture books	*M (SD)*	Read picture books	*M (SD)*	
LQ 1	1	6.09	0.00***	Yes	83.95 (17.68)	No	50 (16.67)	1.97
LQ 2	2	1	0.002**	No	67.31 (25.79)	Yes	46.15 (13.87)	1.02
GQ 1	1	1.72	0.102	Yes	82.47 (25.81)	No	73.84 (21.02)	0.37
GQ 2	2	-1.45	0.173	No	71.92 (29.97)	Yes	84.77 (17.12)	0.53
IQ 1	1	1.31	0.206	Yes	52.63 (25.82)	No	38.63 (35.70)	0.45
IQ 2	2	0.00	1	No	58.92 (27.92)	Yes	58.92 (27.92)	0

*p<.05. **p<.01. ***p<.001
No in the column of read picturebooks means that they read narrative texts

Table 7. Scores of different question types (Between-subjects Design)

Question type	Story	*t* test	*P*	Group 1		Group 2		Effect size
				Read picture books	*M (SD)*	Read picture books	*M (SD)*	
LQ 1	1	2.17	0.038*	Yes	83.95 (17.68)	No	67.30 (25.79)	0.75
LQ 2	2	0.687	0.499	No	50 (16.67)	Yes	46.15 (13.87)	0.25
GQ 1	1	1.06	0.296	Yes	82.47 (25.81)	No	71.92 (29.97)	0.38
GQ 2	2	-1.55	0.131	No	73.84 (21.02)	Yes	84.77 (17.12)	0.57
IQ 1	1	-0.66	0.517	Yes	52.63 (25.82)	No	58.92 (27.92)	0.23
IQ 2	2	-1.71	0.096	No	38.63 (35.69)	Yes	58.92 (27.92)	0.63

*p<.05. **p<.01. ***p<.001

No in the column of read picturebooks means that they read narrative texts

In Story 1, participants in Group 1 who read picturebooks demonstrated a much higher mean score in literal questions (M=83.95, SD=17.68) than that in Group 2 (M=67.31, SD=25.79). A statistically significant difference was found, t (39) =2.17, p=0.038, p<.05. Furthermore, the effect size (d= 0.75) suggested a moderate to high practical significance. Similar to what is shown in paired-samples t-test, no statistical significance was found in neither gist questions nor inferential questions.

When closely looking at students' performances in answering gist questions and inferential questions, it was interesting to see that students' performances did not show patterned differences related to whether they read picturebooks or not. In terms of gist questions, students reading picturebooks had higher mean scores than those who did not in both Story 1 (M=82.47, SD=25.81) and Story 2 (M=84.77, SD=17.12). The effect sizes are medium, with 0.38 and 0.57 respectively. However, with respect to inferential questions in Story 1, Group 2 students read narrative texts perform better (M=58.92, SD=27.92) than participants in Group 1 who read picturebooks (M=52.63, SD=25.82). A small effect size is indicated from the data (d= 0.23). Multiple reasons might result in such circumstances, which we will talk about in the next section.

DISCUSSION

This study examines the effects of picturebooks on K-4 EFL learners' reading comprehension. The t-test results suggest that young EFL learners are benefited from visual effects in picturebooks in multiple choice tasks and ordering tasks, especially in answering literal questions. No significant difference was found in students' performances in gist and inferential questions between two groups. Drawing from dual coding theory and multimodality theory, we will discuss the effects of picturebooks on K-4 EFL learners and the factors influencing learners' reading comprehension.

Positive Visual Effects of Picturebooks

The findings of RQ1 showed that visual effects of picturebooks significantly affect young EFL learners' performances in completing multiple choice tasks and ordering tasks

in reading comprehension. The result is consistent with previous studies. For example, in Huang's (2019) experimental study, it contends that students perform better in multiple choice tasks with visual aids in Chinese as a Foreign Language (CFL) learning. With the help of images, participants in experimental group were found to make connections to the storyline more easily than those who only read texts. Moreover, our study further confirms the visual effects on students' understanding on sequential orders. The t-test result in our study provided statistical evidence for Callow's (2018) study where students well-articulated the story sequence in picturebooks retelling activities.

There are theoretical explanations that help us to interpret the result. According to multimodality theory, multiple modes including images, texts, design, all contribute to the meaning-making processes (Kress, 2010). As a typical example of multimodal texts, picturebooks display information through various media (Unsworth & Macken-Horarik, 2015). The written and visual modes in picturebooks are considered as valuable resources in meaning-making processes from a semiotic approach. The interplay between verbal and nonverbal modes attaches a great impact to readers' comprehension when doing multiple choices tasks and ordering tasks. When learners read texts in multiple modes, both verbal and nonverbal systems work collaboratively to make sense of meanings, including answering questions related to the article, and organizing the sequences of the story. Besides, we can also analyze the effects from the cognitive perspective. DCT theory proposes that mental imagery forms a fundamental aspect of contexts by providing "concrete referents for the language and restricting the set of images that are aroused in any given situation" (Sadoski & Paivio, 2013, p. 51). In EFL learning, context is a key role in students' language learning (Kramsch, 1993). Picturebooks help learners to create a meaningful context where language is situated in scenarios through a display of both texts and images. Such meaningful contexts thus enable EFL learners to comprehend information in the book and organize the development of stories when doing multiple choice tasks and ordering tasks.

In terms of the development of specific reading skills, the findings of RQ2 showed that participants reading picturebooks performed better in literal questions than those

who did not. In reading comprehension, literal questions ask students about direct information from picturebooks, such as vocabularies and facts. With respect to vocabularies, this study's finding is aligned with that of the previous study on effects of picturebooks on vocabulary learning (Hashemifardnia et al., 2018), which positioned that "the clear, colorful and eye-catching pictures" can gain students' attentions to concentrate on vocabularies (p. 255).

Moreover, literal questions ask the information that is more concrete than other two types of questions (inferential and gist questions). Speaking from DCT, concreteness is a vital stimulus factor in referential processes, where readers experience connections between verbal and nonverbal systems. For example, the picture of a dog would activate the imagen of a dog in nonverbal systems and in turn activate referentially related logogens in verbal systems, and vise-versa (Sadoski & Paivio, 2013). Such activated process between two systems makes it easier for young EFL learners to make connections between texts and images in picturebooks, and further facilitates reading comprehension in answering literal questions.

Besides, literal questions are framed by concrete language to ask for facts. For example, in reading comprehension tests in our study, the options are "find a duck", "fall into the water", "find a bone", which are all concrete languages that describe detailed events. According to DCT, concrete language is more likely to evoke mental imagery than abstract language (Sadoski & Paivio, 2013). Therefore, compared with gist questions and inferential questions, students are more engaged by the concrete language in literal questions and relate to imagens that are installed in the nonverbal system. From both the aspects of learners' cognition and multimodal features in picturebooks, we can see that visual effects of picturebooks have a great impact on young EFL learners' literal comprehension in reading.

Factors Influencing EFL learners' Reading Comprehension

In the t-test results in answering RQ 2, we report that there is no pattern found related to picturebooks on participants' performances in answering gist and inferential questions. In this section, we discuss several factors that may influence students' performances in reading comprehension.

First, students' prior knowledge can be a possible factor that affects their performances in answering literal questions, inferential and gist questions when reading with or without pictures. As is discussed above, according to DCT, there is a referential processing when readers gain both textual and visual information. Readers will automatically connect to the related logogens when seeing certain images. Nevertheless, whether or not readers are able to make such connections depends on their own experiences with the world and their prior knowledge in vocabulary labels (Sadoski & Paivio, 2013). Prior knowledge is a significant factor that influences EFL learners' understanding of controversial texts (Kobayashi, 2009) and answering inferential questions (Alptekin & Erçetin, 2011). In our study, when answering inferential questions and gist questions, participants might

evoke various experiences with things and events related to the content in picturebooks. In order to have an accurate understanding of the story, the activation of such prior knowledge needs to be scaffolded by teachers' guidance in the reading process.

Second, the complex relationship among texts and images is a factor that affects EFL learners' reading comprehension as well, both from the cognitive and semiotic aspects. Cognitively, readers would interpret far beyond what is delivered from the texts by elaborating mental imageries (Sadoski & Paivio, 2013). According to the referential process in DCT, referential connections between verbal and nonverbal systems are "not theorized as one-to-one, but one-to-many" (Sadoski & Paivio, 2013, p. 42). For example, in our study, when participants read picturebooks with both images and text simultaneously, they might have a variety of mental representations when seeing an image of a dog, including *dog* in a written form, an image of a dog's house, a mental imagery of how dog plays, etc. Participants' interpretations in each mode may vary from person to person in the process. For example, in Callow's study (2018), students demonstrated different interpretations on colors in picturebooks. Some of them considered it as the reflection of a person's feeling. Some of them thought that it was just due to the sunset. Therefore, EFL learners would read more information from multiple modes, which may affect their understanding to infer or summarize stories.

Speaking from the semiotic approach, texts and images are found incongruous in picturebooks from time to time. There are four types of relationships among texts and images in picturebooks, which are symmetrical, complementary, expanding, and counterpointing (Nikolajeva & Scott, 2013). In our study, the books shared the relationships of both symmetrical and complementary between images and texts. In other words, texts and images either deliver the same meaning (symmetrical) or fill in each other's gaps (complementary). These relationships, especially the complementary, allow students to make their own judgements based on their understanding of different modes. Thus, EFL learners' understanding on the inferential and gist questions may vary from each other due to their understanding on the interplay of multimodalities, which creates space for teachers to offer scaffoldings in the reading process.

IMPLICATIONS FOR EFL TEACHERS

From a pedagogical point of view, our study provides some suggestions on using picturebooks in K-4 EFL class in China or elsewhere. As the study shows the visual effects of picturebooks on EFL learners' reading comprehension, EFL teachers need to pay attention to the value of images when using picturebooks in teaching. Teachers are not supposed to only focus on the texts in picturebooks, but also teach picturebooks as a whole by discussing the meaning from both texts and images. Some strategies are recommended. One example is picture walk (Clay, 1991). Picture walk is a pre-reading conversation where teacher and students preview the book based on pictures. It is a process to create contexts for language learning, to activate students' prior

knowledge, and to encourage students to make predictions. Using the strategy of picture walk is reported to yield statistically significant effects on students' reading comprehension (Scott, 2008; Solihah & Rustandi, 2020), and makes the best use of images in picturebooks in pre-reading activities.

Our study offers implications for the during-reading process as well. According to the t-tests results, we found that picturebooks impose a significant effect on EFL learners' literal comprehension. To apply this result into pedagogy, EFL teachers can emphasize the connections between images and texts when the information is about literal questions, such as facts and vocabularies. Such focus would help students to strengthen the retention of information in picturebooks and further promote reading comprehension. Teachers can also elicit students' prior knowledge when reading picturebooks by asking some probing questions. As what has been discussed in the above section, students' prior knowledge has an impact on their reading comprehension (Al-Jahwari & Al-Humaidi, 2015; Chou, 2011; Kobayashi, 2009). There are some recommendations for EFL teachers when making use of students' prior knowledge. The prior knowledge can help students to make connections between texts and images, and between books and their own experience. However, sometimes young EFL learners will possibly only focus on their own experience and neglect the content in picturebooks without teacher's guidance. Therefore, especially when doing inferential comprehension and summarizing the information, EFL teachers need to explicitly guide students to discuss what the story is about and what students would do in real life. Such scaffolding would help students not only understand the information delivered by the story, but also interpret the story in connection with their prior knowledge.

There are also some tips when choosing appropriate picturebooks for K-4 EFL learners that meet students' needs. First, teachers could look closely at the relationship between images and texts when selecting picturebooks. As is discussed above, symmetrical, complementary, expanding, and counterpointing are four types of relationships among texts and images in picturebooks (Nikolajeva & Scott, 2013). The relationship between pictures and texts would influence students' performances in the reading process. For K-4 EFL learners, it would be better to choose books where images and texts share the symmetrical and complementary relationships, which take less cognitive overload in reading comprehension. Moreover, teachers can choose the picturebooks that students are able to make connections with their life experience. Thus, the choice of picturebooks in EFL class is not restricted in picturebooks from western countries, but can also include local picturebooks that entail Chinese culture. Picturebooks covering cross-cultural communications and intercultural communications are also encouraged to open discussions about various cultures in the world.

CONCLUSION

To conclude, this study confirmed the positive and complex picturebooks' effects on reading. Our study showed statistically significant differences between participants' performances in completing MTs and OTs between those read picturebooks and those read only texts, indicating that picturebooks have an impact on K-4 EFL learners' reading comprehension in multiple choice and ordering tasks (RQ 1). Specifically, this study also demonstrated that participants perform significantly better in answering literal questions when reading picturebooks, among multiple reading skills (RQ 2). Drawing from DCT and multimodality theory, our study discussed the theoretical reasons that explain the effects of picturebooks on young EFL learners' reading comprehension, and the potential factors that are related to students' comprehension when reading picturebooks. The findings of this study fulfill the gap of research among K-4 young EFL learners' reading performances in Chinese context. In addition, our goal is to provide pedagogical implications for reading teachers of EFL at K-4 level. This study considers the importance of the processes of reading and suggested EFL teachers to consider a few classroom teaching strategies related to that: (1) provide scaffoldings in class such as activating students' prior knowledge, (2) make connections to students' experience in the reading process. (3) select picturebooks considering the complex relationship between pictures and texts. In other words, the development of reading should be considered including the text, the images, and the meaning to the readers. Reading is both interactive and semiotic to individual readers who are different in their sociocultural backgrounds.

In terms of future research directions, our study provides pedagogical implications for teachers to emphasize on students' prior knowledge, which calls for future scholars to explore traditional cognitive information processes with sociocultural consideration. In terms of theoretical considerations, this study expands the application of DCT and multimodality theory among K-4 EFL learners in China. Due to the use of picturebooks in EFL education in China is still at a beginning stage, we only examined the effects of paper picturebooks in this study. Future study can explore the effects of digital picturebooks on EFL learners' reading comprehension and other language practices such as writing and speaking.

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APPENDICES

APPENDIX A

Story 1 Biscuit Finds a Friend
Reading Comprehension Task
年龄Age _____
年纪Class level_____
性别Gender_____
国籍Nationality_____
学习英文几年了How many years of English learning

_____
I.   Multiple Choice (单项选择)

Instruction: Please choose only one answer for each question.

(....) 1. 下面哪一项文章中没有提到
A 一只小狗
B 一只小鸭子
C 小狗的名字
D 小狗的新朋友的名字

(....) 2. 文章中"pond"的意思是
A 游泳池
B 小河
C 火锅
D 肥胖

(....) 3. 根据文章，小鸭子可能没有
A 爸爸
B 妈妈
C 姐姐
D 爷爷

(....) 4. 这篇文章主要是讲
A 小狗玩球的故事
B 小鸭子游泳的故事
C 小狗帮助小鸭子的故事
D 小鸭子不回家的故事

(....) 5. 如果要给文章加个题目，下面哪个最合适？
A 小狗的新朋友
B 小鸭子想妈妈
C 小狗玩球
D 小鸭子喜欢玩水

(....) 6. 文章中"Quack"的意思是
A小鸭子叫
B小狗叫
C小鹅叫
D小猫叫

(....) 7. 文章中小狗没做什么？
A 找到一只小鸭子
B 掉进水里
C 交到新朋友
D 找到一条狗骨头

(....) 8. 根据文章，下面哪一项的说法不正确？
A 小狗会叫
B 小鸭子会玩
C 小狗会抖毛
D 小狗没有朋友

(....) 9. 根据文章，小狗和小鸭子分开以后，小狗很可能会做什么？

A 小狗可能会去吃骨头
B 小狗可能会回家
C 小狗可能会洗澡
D 小狗可能会再去找小鸭子
(....) 10. 关于小狗的说法，哪项不能从文章中推测？
A 小狗有点顽皮
B 小狗喜欢和小鸭子玩
C 小狗叫"biscuit"
D 小狗没有家
II.　Reordering (排序)
　　Instruction: Please put these sentences into the right order according to the story. You can use numbers 1, 2, 3, 4.
(....) It's time for Biscuit to go home.
(....) Biscuit fell into the pond.
(....) We will bring the little duck back to the pond.
(....) Biscuit found a little duck.

APPENDIX B

Story 2 Biscuit Goes to School
Reading Comprehension Task
中文英文名字Name　　　(Chinese and English) _____
年龄Age _____
年纪Class level_____
性别Gender_____
国籍Nationality_____
学习英文几年了How many years of English learning _____
I.　Multiple Choice (单项选择)
Instruction: Please choose only one answer for each question.
(....) 1. 下面哪一项文章中没有提到
A 一只小狗
B 一辆校车
C 小狗的名字
D 小狗的爸爸
(....) 2. 文章中"snack"的意思是
A 蛇
B 小鸭子
C 点心
D 小故事
(....) 3. 根据文章，小狗可能不希望做什么
A 上学
B 吃点心

C 坐校车
D 去池塘
(....) 4. 这篇文章主要是讲
A 小狗上学故事
B 小狗找老师的故事
C 小狗喜欢上学校的故事
D 小狗不愿意去上学的故事
(....) 5. 如果要给文章加个题目，下面哪个最合适？
A 小狗上学
B 小狗吃点心
C 小狗游泳
D 小狗玩水
(....) 6. 文章中"woof"的意思是
A 小鸭子叫
B 小狗叫
C 小鹅叫
D 小猫叫
(....) 7. 文章中小狗没做什么？
A 吃点心
B 上校车
C 看到老师
D 和学生交朋友
(....) 8. 根据文章，下面哪一项的说法不正确？
A 小狗会叫
B 小狗喜欢上学
C 小狗喜欢同学们
D 小狗没有朋友
(....) 9. 根据文章，小狗很可能会做什么？
A 小狗可能会和同学们玩
B 小狗可能会给同学们讲故事
C 小狗可能会洗澡
D 小狗可能会再去找校车
(....) 10. 能从文章中推测？
A 小狗喜欢听故事
B 小狗喜欢同学们
C 小狗叫"biscuit"他会叫
D 小狗没有朋友
II.　Reordering (排序)
　　Instruction: Please put these sentences into the right order according to the story. You can use numbers 1,2,3,4,5.
(....) Biscuit wants to hear a story.
(....) Biscuit is going to school.
(....) Everyone at school likes Biscuit.
(....) Biscuit wants to meet the teacher and the class.
(....) Here comes the teacher.