The impact of picture books on Chinese low-level English learners' reading comprehension and information acquisition: An experiment from the systemic functional perspective.

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Acknowledgement

If I had to sum up this past year in one word, it would be ‘unexpected’. When I applied to Oxford offhand, I didn't expect I would get an offer, so up until now, I still feel like my studies at Oxford were a dream. Actually, ‘unexpected’ may also be the appropriate word to describe my whole life so far. After all, who would have thought that a girl who was born prematurely more than 20 years ago, weighed only 1.9kg and was told by doctors that there was a high probability that she would not be able to grow up, would get into a top school on this planet. So, every piece of good news that was not envisaged was a delightful gift to me, and to the people who loved me dearly. I am then constantly reminded myself to be grateful for everyone and everything around me.

I don't know who to start with to express my gratitude, perhaps I should follow the timeline of this project. If I had to pursue an origin, the seeds of this project would have been planted in a class called Language and Context in Year 2. In that module, I learned various models and became interested in multimodal analysis. The module convener Dr. Dan Shi, who later taught me the Systemic Functional Linguistics in my Year 4 and supervised my undergraduate dissertation where I used SFL-MDA analysis to analyze a Covid picture book, is the first name I would like to say thank you to (Sorry Faidra, but you also mean a looottt to me, I promise!). She was the person who guided me into discourse analysis area, cultivated my interests, and helped me to establish a solid theoretical foundation. She was the person I worked with for the longest time during my undergraduate degree.

However, the more time I spent on discourse analysis, the more I felt that analysis itself was not the whole of research. I started to think about the question, 'so what? So how can I use these analysis results with learners, with the target group of picture books'. This is when Faidra came to my life. Faidra had a lot of experience in doing

experiments and I knew a lot about discourse analysis, so every time we had our supervision meeting, our minds collided in a brilliant way. It's no exaggeration to say that I almost learned how to design a large-scale experiment from Faidra. If I had to describe what kind of person Faidra is, I would say she is super super super supportive and patient. Thus, I always turn to her when I met problems, felt stressed and felt lost. Thank you Faidra for being my supervisor!

After designing the experiment, it was the time to put the literal plan into practice. This was the phase of the whole project where I suffered the most. As I was planning to go back home to collect the data, China's policy on people returning from abroad was so strict that I couldn't even guarantee that I would be able to return to China without any problems due to the Covid. With only one piece of return ticket that worth £3,300, I managed to get back to China! Thanks to my friends (Chuchu Chen, Xuechun Huang and Liuyi Fan) who were there for me during this stressful period. Chuchu, Xuechun and Liuyi are my best friends in Oxford, and believe it or not, we became ‘lunch mate’ from the first day we arrived at the Department (Hey! Do you miss the lunch of LMH?)!

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12/08/2022 I submitted this thesis. It was also the day I started a new chapter in my life, because on this day I joined Hangzhou Yungu School and became a primary school English teacher. This was because as I was doing my experiments, I became increasingly convinced that research that is divorced from practice is meaningless. I still love my research topic, but I decided to explore the real learning environment. To work with children and to apply my findings.

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Thesis Abstract

Picture book is a popular resource used among children in many educational situations. Teachers and parents use picture books to cultivate children's literacy ability, aesthetic ability and help them to know about the world and themselves. Yet little is known about the relationships between picture book, reading comprehension, information acquisition, and vocabulary learning. This study examined whether picture book reading can help children understand story and infer the meaning of unfamiliar vocabulary. On the basis of the experiential meaning analysis using Systemic Functional Linguistics (SFL) and Multimodal Discourse Analysis (MDA) models, this study further examined whether children acquired three types of information: actions, participants and circumstance differently. The experiment was conducted in a Chinese public primary school with Grade 5 children, and 97 valid data was collected. Followed by the experiment, I also conducted guided think-aloud interviews to qualitatively examine the role of picture books in vocabulary meaning inference. The experimental results showed that the picture book (PB) group did not perform significantly better than the other two groups only receiving pictures or text, but participants in the PB group performed significantly better in answering the picture-version questions than the text-version questions, suggesting that picture information might be easier for children to acquire. For the information types, action information was the hardest type for all children to obtain, and the participant information was the most accessible one for the picture book group. Finally, the interview revealed that picture book could help children infer the meaning of unknown words. During the inference, children would use various types of information as references, including text, picture and context information provided by the book, prior world knowledge and prior linguistic knowledge. The interview also noted that low-level learners tend to use more picture references than text references.

Word Count: 293

List of Abbreviations

SFL:	Systemic Functional Linguistics
MDA:	Multimodal Discourse Analysis
CDA:	Critical Discourse Analysis
DCT:	Dual Coding Theory
L2:	Second Language
ESL:	English as the Second Language
EFL:	English as the Foreign Language
PRO:	Picture-book Reading-Only
PRVI:	Picture-book Reading with Vocabulary Instruction
PRCOA:	Picture-book Reading with a reading-based Collaborative Output Activity
ANOVA:	Analysis of Variance
ANCOVA:	Analysis of Covariance
BPVS3:	British Picture Vocabulary Scale 3
G5:	Grade 5
PB:	Picture Book Group
PO:	Picture Only Group
TO:	Text Only Group
AQ:	Action Question
PQ:	Participant Question
CQ:	Circumstance Question

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1. Introduction

The picture book is a bimodal (text-picture) aesthetic genre that is rich in content (Doonan, 1993 & 2003; Nodelman, 1988; Tian, 2010; Wu, 2014; Whalley, 2004). Unlike traditional children's storybooks that are supplemented by pictures, the meaning formation of picture books depends on the combination of text and pictures (Wu, 2014). Thus, picture book readers often need to look back and forth between the pictures and the text to better understand the story. At first glance, the readership of picture books seems to be narrow and explicit——children, but an increasing number of studies also call for adult involvement when children read picture books (Bishop & Hickman, 1992 Tian, 2010). This is because researchers have realised that the meaning of a picture book is often negotiated between children and adults in an oral modality (Painter et al., 2013).

Apart from being a good resource for building a harmonious relationship between adults and children, picture books constitute a special genre and have different effects and goals from normal, text-only materials. Firstly, picture books can develop (multi)literacy abilities and enrich vocabulary in a fun way (Cianciolo, 2000; Hladíková, 2014; Mateo; 2015). Images from picture books can be an effective cue for identifying words and illustrating new meanings (Grundvig, 2012). Secondly, picture books can cultivate aesthetic abilities through exposure to different depiction styles of pictures in picture books (Painter et al., 2013; Wu, 2014). In other words, children will learn to appreciate pictures and beauty by seeing pictures in various styles such as naturalistic, generic and minimalist pictures (based on the level of detail and realism of the drawing) (Painter et. al., 2013; Welch, 2005). Finally, reading picture books can help children to establish self-awareness and social abilities through reading and interaction with parents, teachers and peers (Cianciolo, 2000; Hladíková, 2014; Mateo; 2015; Wu, 2014), because images can motivate emotional responses and support children's cognition (Levie & Lentz, 1982).

Owing to these advantages, picture books are often used with young children, in school and home domains. Unsurprisingly, picture books have permeated the second language (L2) learning context and have become indispensable materials in language teaching and learning contexts (Zhou et al., 2021). In China, many schools even offer English picture book classes to help children build an initial interest in the language by providing them with authentic reading materials (Wang & Ao, 2017; Zhou et al., 2021). Parents also choose picture books rather than textbooks to motivate their children to learn a new language. The colourful pictures, and coherent story plots, can attract children's interests and make the learning journey more interesting.

Previously mentioned advantages of the picture book, and the widespread of picture books in the L2 context, makes picture books worth investigating. However, previous research on picture books, especially starting from the 21st century, paid little attention to examining their effects on reading comprehension in experimental situations, and has not fully justified picture books thoroughly before designing the experiment materials. Also, the role of picture books for key vocabulary meaning inference was not fully demonstrated in the experimental context. As for the research context, very little research has been situated in an English as the Foreign Language (EFL) learning context in China. To this end, this dissertation will examine the effect of picture books on reading comprehension, understanding of different information types (here, it mainly refers to three types: participants, processes and circumstance) and vocabulary inference among Chinese low-level English learners from the systemic functional perspective. To achieve this goal, the dissertation will first review the relevant studies in this area. Then, a Systemic Functional Linguistic (SFL) analysis and Multimodal Discourse Analysis (MDA) will be conducted to examine the experiment material (the picture book). After detailing the SFL and MDA analysis, this paper will present in detail a mixed methods study (consisting of an experimental trial and post-test interviews) that was designed based on the analytical results. Finally, the quantitative

and qualitative results of the study will be presented before discussing the results and providing possible explanations and practical implications.

2. Literature Review

Picture books often have a didactic purpose and include a range of themes, scenarios, and emotional repertoires (Cianciolo, 2000; Tian, 2010). The explicit educational purpose of the picture book and the inclusiveness of its content make it a focal point for research. Also, the aesthetic nature of picture books not only requires writers and illustrators to use their skills and talents in composing the picture book (Cianciolo, 2000), but makes this genre a unique resource for linguistic and art analysis. Thus, the investigations towards picture books mainly stem from two perspectives: education, as well as semiotic and art. Following these two perspectives, this section will separately review relevant analytical and empirical studies and detailly note the research gaps in the study of picture books.

2.1. Art theory and Semiotic Oriented Analytical Studies

Studies that treat picture books as textual objects do not often focus seriously on the pictures, and researchers often only include laudatory and general comments on the images (Painter et. al., 2013; Unsworth & Wheeler, 2002). Despite the researchers' lack of interest, guidance on how to critique visual elements of picture books has existed since the publication of Nodelman's Words about Pictures in 1988, which continues to be the authoritative text in the field. Nodelman (1988) drew insights from art-related sources, including Arnheim's (1974) Art and Visual Perception and Moebius's (1986) 'picture book codes', and further discussed a variety of styles of pictures. Nodelman also explained how picture books create a special 'tone' by choosing different colors, framing, textures, media, sizes and shapes of visuals, providing generalizable and illuminating insights into the analysis of the picture. The sophistication of picture books as visual texts can also be shown in Painter, Martin and Unsworth's (2013) multimodal discourse analysis (MDA) model that was specifically designed for picture books. Painter et al's (2013) model will be introduced in more detail in Section 3.2. together with other models that frame the dissertation's theoretical background.

Relative to studies focusing primarily on pictures, more studies have focused on the bimodal nature of picture books, and also revealed the sophistication of the work involved in analysing a picture book (e.g. Cech, 1983; Lewis, 2001; Miller, 1992; Pullman, 1989; Wyile, 2006). These studies often focus on describing the text-picture relationships and attempt to taxonomize the possible relationships between words and pictures. The earliest study trying to explain the text-picture relationship derived analogies from other academic areas in order to indicate the characteristics of text-picture relationships. For example: (see Table 1)

Analogy	Citation	Domains the analogy comes from	The feature of the text-picture relationship that the analogy encodes
Counterpoint	(Pullman, 1989)	Music	the individuality of each modality is retained in the bimodal relationship;
Duet	(Cech, 1983)	Music	the individuality of each modality is retained in the bimodal relationship. the bimodal relationship changes constantly;
(Dis)harmony Dissonance	(Massey, 1980)	Music	meaning is created by the joint effort of the two modalities.
Like a play	(Wyile, 2006)	Drama	the individuality of each modality is retained in the bimodal relationship. meaning is created by the joint effort of the two modalities.
Ecology system	(Miller, 1992)	Science	the individuality of each modality is retained in the bimodal relationship. the bimodal relationship changes constantly;
(wave) Interference	(Lewis, 2001)	Science	the bimodal relationship changes constantly; the individuality of each modality is retained in the bimodal relationship.

Table 1. Art and Scientific Analogies Explaining the Text-picture Relationship

As research progressed, typologies were proposed to systemically categorize different relationships. The earliest one was Schwarcz's (1982, cited in Sipe, 2012), suggesting 'congruency' and 'deviation' as two main types of the text-picture relationship. A more recent attempt by Nikolajeva and Scott (2000, 2006) involves a relationship continuum,

containing a scale with five main points:

1) Symmetrical picture books, which have 'two mutually redundant narratives;'

2) Complementary picture books, where "words and pictures have the function of 'filling each other's gaps';"

3) Expanding or Enhancing picture books, where the 'visual narrative supports verbal narrative' or 'verbal narrative depends on visual narrative;'

4) Counterpointing picture books, with 'two mutually dependent narratives;'

5) Sylleptic picture books 'with or without words', where 'two or more narrative [are] independent of each other' (Nikolajeva and Scott, 2006, p.12)

Classification schemes such as these made the analysis and description of the bimodal relationship possible in future work. However, one general problem with this line of research is that it allows for only one type of relationship throughout the whole picture book (Painter et al., 2013), which is often a deviation from reality. For example, it is possible for one picture book to have a symmetrical relationship in the first half of the story, but changes to the enhancing or counterpointing relationship later when the first half of the story has established readers' basic knowledge. The dynamics make it more challenging for researchers to precisely describe and define the text-picture relationships of a certain picture book.

Attributed to endeavor from the art and semiotic perspectives, the analytical studies of picture books have given rise to two consensuses: (1) pictures should be comparable to texts, and (2) the meaning conveyed by a picture book is more than the sum of individual modalities, including text, pictures and other peritextual elements (Cianciolo, 2000; Painter et al., 2013; Sipe, 2012). These observations restated the importance and necessity of investigating the genre of the picture book encompassing both of its modalities.

2.2. Education Oriented Empirical Studies

Much of the important literature paid attention to the use of picture books in educational scenarios. Some studies investigated children's responses to the picture books during or after reading to shed light on their literacy and multiliteracy abilities (an ability beyond the linguistic notion, refers to the ability to understand, interpret, and communicate across visual, oral, and other modalities; New London Group, 2000) as a result of reading the picture book(e.g., Arizpe & Styles, 2002, 2003; Crawford & Hade, 2000; Kiefer, 1995; Lewis, 1992; Pantaleo, 2002, 2004, 2008; Styles & Arizpe, 2001; Torr, 2008). After classifying the different types of responses children generate during picture book reading (Crawford & Hade, 2000), comparing children's responses to those of adults (Lewis, 1992; Torr, 2008), and investigating age differences (Arizpe & Styles, 2002, 2003; Styles & Arizpe, 2001) and differences among various picture books (Pantaleo, 2002, 2004, 2008), studies have generally agreed that 'picture books encourage intellectual growth in children' (Arizpe & Styles, 2003, p.27). Other picture book studies have been more concerned with reading comprehension (e.g. Gambrell & Jawitz, 1993; Jalilehvand, 2012; Purnell & Solman, 1991; Roslina, 2017), language learning (e.g. Damayanti & Febrianti, 2020), and lexical acquisition (e.g. Hashemifardnia et al., 2018; Nicholas, 2007; Sun, 2017; Vungthong et al., 2017). These studies have a stronger connection to the current study and will be reviewed later.

2.2.1. Images and Reading Comprehension

2.2.1.1. Dual Coding Theory — A Theoretical Construction

The effects of images on reading comprehension have been described and explained by many theories from a cognitivist viewpoint (a psychological viewpoint that tries to explain human behavior in terms of cognitive mechanisms such as information processing, storing, and retrieving). One of the most frequently addressed theories to demonstrate the impact of images on reading comprehension is Paivio's (1971; 1986; Sadoski & Paivio, 2001) Dual Coding Theory (DCT). In DCT, the linguistic coding

system is named the *verbal system*, and the non-verbal coding system is the *imagery system*. When readers encode information from both systems, they are able to analyze external scenes and generate internal mental images. The crucial point of DCT is that, as argued by Paivio, information in either system can prompt and activate information in the other system, making the combination of both systems works better than either alone. DCT also assumes that the verbal system and imagery system are organized differently, with the former being organized sequentially and the latter non-sequentially, resulting in different but complementary processing styles.

In reading comprehension, DCT predicts that adding concrete pictures and graphs can enrich the mental representations and decrease the cognitive load when readers approach texts that have few mental images to rely on (e.g., unfamiliar topics). The DCT also accounts for the top-down (reader's knowledge of the language and the world helps readers to predict the upcoming words, thus driving the reading comprehension, e.g., Goodman, 1967) and bottom-up (reading starts from the recognition of letters and words to syntactic processing, clause understanding, comprehension and finally the interpretation of the whole text, e.g., Gough, 1972) views of reading comprehension (Liu, 2004). Regarding top-down processes, DCT suggests that mental representations of both modalities are activated to create interconnected contexts, which can help readers integrate the whole text and generate inferences of the story meaning. When reading picture books, the text and pictures can create different contexts which remind readers of different worlds and prior language knowledge, enabling readers to draw different inferences and integration. For bottom-up processes, DCT assumes that parts of the language (e.g., words and phrases) are mentally represented in various senses (e.g., visual, and verbal). Based on their familiarity with those representations, readers can comprehend the visual, auditory, and articulatory configurations of letters or lexis. For example, picture book readers whose mental images were strengthened by the providing pictures can figure out links between graphemes and morphemes, meanings

and linguistic representations, thus helping them to build a robust comprehension.

2.2.1.2. Empirical Studies

The effects of images on reading have also been investigated in empirical studies. However, the findings regarding the effect of pictures on reading comprehension differ. Some studies found adding images can benefit readers' reading comprehension (Gambrell & Jawitz, 1993; Grundvig, 2012; Jalilehvand, 2012; Purnell & Solman, 1991; Roslina, 2017), while others did not (Eng & Chandrasekaran, 2014; Liu et al., 2009; Mounguengui & Ilouga, 2019; Pike et al., 2010).

Roslina (2017) conducted a pretest-posttest experiment involving 15 participants and noted a positive effect on reading comprehension. A questionnaire, reading test, observation, and interview were used to collect data. The data showed that children who received picture book treatment experienced a more significant improvement in reading performance compared to the control group that only read text. The interviews showed that participants also believe that picture can aid their comprehension. Similarly, Gambrell and Jawitz (1993) noted that their 'with illustration' group outperformed the control group in a proposition recall test (the proposition here is defined as a predictor or relational verb, Kintsch, 1974). However, they also noted that an 'illustration plus mental imagery' condition could have even better results than the 'illustration only' condition in both propositional recall and structure recall tests (tests focus on the internal organization of the story). This finding indicates that, although pictures could help children understand the story, we might see more robust results if readers receive extra mental support (e.g., mental imagery activities). The convergent results of the two studies were replicated in a systematic review (Levie & Lentz, 1982), according to which the positive effect of illustrations on comprehension was found in various studies with different image types (learner-produced drawing, mental imagery, pictures on the book), reading materials (explanatory text—a type of non-fiction text

that explains a process, stories, biology lesson materials, social study texts etc.), testing formats (multiple-choice questions, short answer questions, yes-or-no questions, content free-recall) and age groups (from Primary Grade 1 children to college students). However, this systematic review was conducted in the last century and many changes have been made methodologically since then, so updated reviews are called for.

In addition to native speakers, images have also been found to help language learners with their reading comprehension (Liu, 2004; Omaggio, 1979; Pan, 2009). Liu (2004) conducted an experiment exploring whether comic strips can impact English as the Second Language (ESL) learners' reading comprehension. Participants were categorized into high-level readers and low-level readers. Each level was grouped into four conditions with different treatments: low-level text; low-level text with comics; high-level text; high-level text with comics. After analyzing the immediate free recall of each participant, the author found that, both high- and low-level 'with comics' students performed significantly better in recall protocols when exposed to the same level of text. Additionally, low-level 'with comics' readers performed significantly better with the more difficult text, even though they have difficulties understanding high-level texts. Liu's (2004) results were also supported by Pan's (2009) study, which also found that pictures have positive effects on low-level language learners' comprehension, not only for texts that meet their language level, but also for texts that exceed their abilities. These two studies indicated the effectiveness of pictures on language learners' reading, regardless of their reading level and the material difficulties.

However, opposing results have also been reported in related literature. For instance, Mounguengui and Ilouga's (2019) experiment involved 52 children aged 7-9, forming two groups, one that saw a text with illustrations and one that saw the same text but without illustrations. The participants were asked to read the text in two phases: first on computers and then on papers with highlighted keywords and ideas. After reading,

the participants' comprehension was tested by four multiple-choice questions and the recognition of the keywords and ideas. The results did not show a significant effect of the illustration condition on participants' comprehension in the questions ($p=0.75$), although the 'with illustration' group had a small, descriptive difference relative to the other group. Concerning the keywords and ideas, the presence of illustrations did have a significant effect on the results ($p<0.05$), thus illustrations helped children to recognize and emphasize the keywords and ideas. Mounguengu and Ilouga (2019) suggested that the unexpected non-significant results could be attributed to the participants' insufficient L2 knowledge, as the lack of knowledge can prevent the mental models of text modality from enhancing reading comprehension. They also argued that it was the educational level of the participants that led to the non-significant results, as the study was primarily concerned with young children who were at the early stage of formal education. However, we can see that Mounguengui and Ilouga's (2019) study did not involve many participants (26 per group), and the questions testing reading comprehension were inadequate (4 questions), which may have impacted the accuracy of the study results. Also, the participants were at different ages when the experiment was conducted, which means that children at age 7 were at a different literacy level compared to age 9 children. However, researchers did not justify how the age factor was controlled. Therefore, it is unknown how the age factor could impact the experiment results.

Despite the flaws in some experiments that found non-significant results between picture modality and reading comprehension, positive effects were found in other studies (e.g. Grundvig, 2012; Gambrell & Jawitz, 1993; Roslina, 2017), and which we took for granted, also disappeared in some well-powered studies. Eng and Chandrasekaran's (2014) study compared the effect of text with contextualized storytelling, text plus picture reading and text-only reading on comprehension. 90 Malaysia Grade 5 English learners participated in the experiment. While contextualized

storytelling led to significantly better comprehension, a non-significant result emerged between text-only reading and text+picture reading. Eng and Chandrasekaran's (2014) results indicated that simply adding pictures to text reading may not necessarily help children's reading comprehension. What made the reading to be more effective is the interaction between the reader and the text. Thus, they suggested that teachers should serve more positive in primary school ESL classrooms to help children interact more with the target language.

The discrepant results indicate that the relationship between images and reading comprehension is complex, further studies have found that the effectiveness of picture books may depend on intermediate factors such as image types (Guo et al., 2020; Mayer & Gallini, 1990), assessment formats (Guo et al., 2020), learners' characteristics (Gerber et al., 1995; McTigue & Flowers, 2011; Roberts & Brugar, 2017; Stylianidou, 2002), and text genres (Duke, 2000; Shanahan & Shanahan, 2008; Willingham, 2004). Regarding learner characteristics, the factor that is closely associated with the current study, age seems to be a crucial factor. Younger readers may consider the picture components in isolation rather than in conjunction with the text (Gerber et al., 1995), and can only understand partial information from the pictures (Roberts & Brugar, 2017). Also, young children are unable to understand the intended meaning of graphic conventions, such as an arrow (McTigue & Flowers, 2011; Stylianidou, 2002).

2.2.2. Language Learning with Picture Books

In addition to the effectiveness of images and picture books for English language learners' reading comprehension, the field of L2 acquisition also explored picture books' place in language teaching classrooms, ranging from primary schools to universities (e.g. Appelt, 1985; Hadaway & Mundy, 1999; Malu, 2013; Mourão, 2016; Sun, 2015). Sun (2015) conducted five 100-minute picture book lessons for intermediate-level university English learners. Each lesson contained three stages: warm-up, individual

reading, and a literacy activity that included discussions and presentations in small groups. After analyzing the observation notes and the video recordings, the author found that integrating picture books into EFL lessons can help young adults to have positive attitudes; be more focused on lessons and tasks; interact with text, illustrations, and peers; and engage in learning. For primary school lessons, Mourão (2016) revisited the definition and the text-picture relationships of picture books and encouraged teachers to choose picture books with more complex text-picture relationships. She argued that thinking and filling the gaps between the pictures and the words would become a challenge for learners. Learners then need to mobilize their previous language knowledge and learning skills which can foster a positive learning experience. Although picture books were found to be helpful in language learning in general, and suggestions have been made to improve the use of picture books, many empirical studies failed to synthesize common practices for using picture books to learn English effectively for a long time. Only until recently have practical and comprehensive resources and databases been created for teachers to access (e.g., ICEPELL, 2019, https://icepell.eu/index.php/icekits/); thus, further research is in no doubt necessary in the intersection of picture books and EFL.

2.2.3. Vocabulary and Picture Books

Studies have identified a bidirectional relationship between vocabulary and picture books, such that reading picture books can assist vocabulary acquisition and retention (Hashemifardnia et al., 2018; Nicholas, 2007; Sun, 2017; Vungthong et al., 2017) and vocabulary size can predict picture book reading performance (Lepola et al., 2020). Hashemifardnia et al (2018) investigated the effects of picture books on vocabulary acquisition in 40 Iranian primary school EFL students. After receiving a vocabulary pre-test, the experimental group (N=20) received vocabulary teaching using a picture book called Starters Word List Picture Book, while the control group (N=20) used the school textbook (with Persian equivalents, without pictures) to learn the same words.

The post-test showed that there is a significant difference between the pre-test and post-test scores of the experimental group, but not of the control group. Thus, the researchers concluded that using picture books as a treatment can have outstanding contributions to children's vocabulary learning.

However, reading alone may not make picture books effective for vocabulary learning (Jawitz, 1993). Sun (2017) compared the effects of three instructional models on 80 adult EFL learners' vocabulary acquisition and retention: picture-book reading-only (PRO), picture-book reading with vocabulary instruction (PRVI), and picture-book reading with a reading-based collaborative output activity (PRCOA). Participants received 300 minutes of intervention per week. Immediate post-tests were used to examine vocabulary acquisition, and the delayed post-tests (1 month later) were used to test word retention. The results showed that the PRVI model is the most effective for vocabulary learning, and the PRCOA model worked the best for vocabulary retention, especially regarding productive skills. The results of Sun's (2017) study, together with Gambrell and Jawitz's (1993) results, revealed the importance of active pedagogical involvement in picture book reading.

Although little is known about the contribution of vocabulary to picture book comprehension, vocabulary is an important predictor for picture book reading performance. Lepola et al. (2020) conducted a longitudinal study on 90 Finnish-speaking children. They assessed children's vocabulary knowledge and wordless picture book comprehension skills when they were in preschool (age 5). Later, they collected children's level of comprehension one year later (age 6, kindergarten) and four years later (age 9, Grade 3). The results showed a positive correlation between the vocabulary level at age 5 and picture book reading, but the association was not strong enough to generate a predictive difference. This finding reminds researchers to consider children's vocabulary knowledge during experiments and control it, if necessary,

during the statistical tests.

2.3. Gaps in Researching Picture Book

After reviewing previous literature, several research gaps can be noticed. First and foremost, the two main research perspectives (semiotic-analytical and educational-experimental perspective) on picture books are separate from each other. The analytical studies are material-cantered, while the empirical studies are reader-cantered. However, both perspectives are limited in researching picture books' function in reading comprehension and vocabulary acquisition. Many empirical studies are using poorly justified materials, and the analytical studies often do not take the reader, the main target of picture books, into consideration. A second limitation pertains to the analytical model. The current analytical work on picture books pays attention to the pictures or the text-picture relationship, resulting in the lack of attention to the text. However, as a bimodal genre, the text also needs to receive the same attention. Analytical work on text is also needed in current and future studies. The final gap concerns the limitations of educational studies. Although research has confirmed that picture books can help with reading comprehension, few studies have focused on the comprehension of different information types. That is, little is known about whether picture books can help children learn about the action, the participants, and the circumstance information of a story. Moreover, although we know picture books can help children learn vocabulary, we rarely have information on which modality children rely on more: text or picture. Furthermore, Chinese low-level English learners have not been studied in this area.

To address the first research gap, this study will combine both perspectives, by using analytical models to analyse the material and treating the analysis results as the basis of designing the experiment and interpreting the results. For the second limitation about the choice of the analytical modal, I will use the Systemic Functional Analysis model

(Halliday & Matthiessen, 2013) to investigate the text, and use Painter et al's (2013) model to analyze the picture part in the analysis part of this study. As the establishment of MDA was based on the SFL model, using SFL to analyze the text part is a reasonable and the most appropriate choice. By comparing the analysis results of two modalities, the researcher can have a better understanding of the text-picture relationship, which will help the design of experimental materials. For the third gap, this study will pay attention to Chinese low-level English learners' acquisition of three types of information: participants, processes, and circumstance. The three information types are also an analytical focus of the SFL-MDA analysis, which can make the investigation of the information type of this study more reasonable and coherent.

In the following sections, this study will first introduce analytical models and use them to justify the material thoroughly. Then, it will introduce the design of an experiment. Based on the analysis results, this paper tries to answer the following research questions:

RQ 1: Do three groups perform differently in the post-test after controlling for the effect of existing vocabulary knowledge and working memory skills? Do the three groups perform differently depending on the type of information (action, participant, circumstance) that the questions focus on?

RQ 2: Does the type of information (Action, Participant and Circumstance) children obtain from the two models vary?

RQ 3: What is the relationship between vocabulary and picture book reading?

According to previous literature, I predict that the picture book group will perform significantly better than the other two groups in reading comprehension. The picture-only group can also understand the story better than the text-only group, as the participants were low-level English learners who have little previous English knowledge. As for the relationship between vocabulary and picture books, it is expected that picture books can help learners to better understand the words by providing bimodal references.

3. Systemic Functional Models as the Theoretical Background

In this chapter, I will first briefly introduce the systemic functional analysis (SFL) and multimodal discourse analysis (MDA) modal. This chapter will also summarize SFL and MDA the analysis results of The Fist Slodge to shed light on the experimental material design and pave the way for the discussion chapter.

3.1. The SFL Framework

Systemic Functional Linguistics (SFL) is a functional-semantic approach to the exploration of language, introduced by Halliday in the 1950s (Almurashi, 2016; Eggins, 2004; Halliday & Matthiessen, 2013; Thompson, 2013). SFL, as its name implies, focuses on two parts: the structure of language as a social semiotic system, and the functions of language use in different contexts (Eggins, 2004; Fontaine, 2012). The language structure as a semiotic system means that the language is systemically organized and represents resources for speakers to generate meaning (Fontaine, 2012; Halliday & Matthiessen, 2013). In other words, language is a system of options that enables language users to choose the option they perceive as appropriate for conveying meaning. The structure is admittedly a fundamental part of language; however, it takes a less prominent role in SFL, because it is seen as 'the outward form taken by systemic choices, not as the defining characteristic of language' (Halliday & Matthiessen, 2013, p.23). For Halliday, the more prominent and fundamental driving force for language is its (meta)functions (three main meanings every text has: experiential, interpersonal, textual meanings), realized by choosing different structures (Eggins, 2004; Thompson, 2013). In terms of function, the analysis focuses more on 'how and why people use language' and the 'grammatical and semantic roles assigned to parts of language' (Fontaine, 2012, p.5).

As a linguistic approach to language analysis, SFL shares common ground with other syntactic and discourse analysis models (e.g. Labov & Fanshel, 1977; Mann &

Thompson, 1987; van Dijk, 1977). SFL also connects with research in sociolinguistics (e.g. Labov, 1972a; 1972b) and the ethnography of language (Hymes, 1972; Tannen, 1989), where researchers explore how social and cultural contexts impact language choice. As a semiotic approach, SFL has common ground with Fairclough's (1989, 1992) Critical Discourse Analysis (CDA). However, what distinguishes SFL from other approaches is that it tries to develop both a social theory and an analytical methodology, permitting a detailed explanation of both language use and language choice.

3.1.1. Three Metafunctions

In SFL analysis, the main grammatical unit is Clause, which is roughly similar to the notion of a simple sentence from the orthographic perspective (Fontaine, 2012). In each clause, different linguistic elements represent different grammatical functions and lead to the multifunctional nature of a clause. Halliday adopted a three-strand system: the *experiential metafunction* (meaning), *interpersonal metafunction* and *textual metafunction*. Experiential meaning sees language as the representation of speakers' experience of the real world (Halliday & Matthiessen, 2013). In a text or in speech, experiential meaning focuses on the content which becomes the essential part of the receivers' understanding and comprehension. Interpersonal meaning views clause as the carrier of social interaction (Thompson, 2013), as people can use language to interact with others and convey information such as power and reader-writer relationships, as well as intercultural differences. The textual metafunction refers to how the text is organized to fit the language context. Compared to the previous two functions, the textual meaning, according to Halliday, is more intrinsic to the language (Fontaine, 2012).

According to previous definitions, it is obvious that, when assessing children's comprehension, almost all comprehension questions will start from the experiential meaning, as reading comprehension questions tend to focus on whether children

understand what happened in the story. In other words, we can hardly see reading comprehension test sheets asking children questions about the reader-writer relationship, the power relationship, and the intercultural difference. Although the coherence and cohesion of textual meaning are important in understanding a story, they have received more attention in studies concerning complex and difficult texts. The content of a story and its plot (experiential meaning), on the other hand, is the initial analytical focus of simple and easy texts prepared for low-level readers. Also, the experiential meaning is the most testable among all three metafunctions. Considering these reasons, and limited by the study timeline, checking children's comprehension in this paper refers primarily to the experiential metafunction, which captures the information of 'who did what in what circumstance'.

3.2. The MDA Frameworks

The establishment and development of Multimodal Discourse Analysis (MDA) were inspired by Halliday's Systemic-Functional theory of language in the 1950s (Painter et. al., 2013). Kress and van Leeuwen (1996, 2006) designed the first MDA model to describe the 'visual meaning' of multimodal materials. Later, more versions of MDA models designed for specific genres were proposed. For example, O'Toole's (1994) model is specific to fine art painting, and Lemke's (2002) model is specific to online websites. All of these models share the same three metafunctions as SFL (Painter et. al., 2013), but the terms used to refer to these metafunctions are slightly different.

To foreground metafunction continuity across different types of multimodal materials, Painter, Martin and Unsworth (2013) proposed the MDA model for picture books. This model is also going to be used later in the dissertation (Chapter 3.3). As the meaning of picture books is conveyed through the combination of text and picture (Wu, 2014), Painter et al's (2013) model not only follows the three-strand tradition of previous models but also puts forward the text-picture relationship to make the model more

suitable for picture books.

3.3. Analysis for The First Slodge

In this dissertation, Halliday's SFL model (Halliday & Matthiessen, 2013) will be used for the analysis of the text, and Painter et al's (2013) MDA model will be used for pictures. The participants, processes and circumstance will be examined separately to help the researcher understand the story and design the experiment. The researcher will compare the results to examine the intermodality relationships of a picture book entitled The First Slodge. (Limited by the word count, detailed introductions of SFL and MDA's analytical techniques for the participants, processes and circumstance will be presented in Appendix I and J)

The First Slodge is a funny, striking fable about sharing, and how the world belongs to everyone. The main characters of this story are two Slodges and a Snawk. The First Slodge was written by Jeanne Willis and illustrated by Jenni Desmondand (2015), containing 12 spreads (24 pages) and 277 words. It is a book designed for English native children aged 3-7. The Lexile measure of this book is AD370L (Lexile & Quantile Educator Academy, 2022), which means this book is for beginning readers.

3.3.1. Purpose of Doing the Analysis

The main purpose of doing this analysis is to help the researcher design the post-test material (post-test sheet, and interview questions). As this research project tries to find out which type of information (participants, processes, and circumstance) children can better acquire from reading the picture book, the SFL and MDA analysis can provide the researcher with a better understanding of the story content and the information types of The First Slodge. The analytical models can help this study focus on the understanding of certain types of information. Additionally, by comparing the analysis results of both text and picture, the researcher can make sure that the post-test is not

asking children about information that they have not been exposed to. Finally, the involvement of the SFL and MDA model can also address the problem of using poorly justified materials that was identified through the review of previous research.

3.3.2. The Analysis Results

In this section, I will present the general analysis conclusions according to three information types. As limited by the word count, here I would only keep analysis results which are necessary for the design of the experiment materials. The detailed analysis results will be presented in Appendix K and Appendix L. I will also compare the results of the two modalities and investigate the text-picture relationship within each information type.

3.3.2.1. Participants

In the text, there are two categories of participants: Slodges and the Snawk as subjects, and the natural phenomena and entities as objects (e.g., 'sunset; sunrise; flower, fruit'). For natural phenomena and entities, they do not appeared in isolation, but have three main types of pre-modification: numerative determiner—'first' (Clause 3, 6, 9, 10, 11, 12, 30); deictic determiner—'my' (Clause 4, 7, 26, 28, 38, 40, 43, 48, 50) and 'our' (Clause 54, 56, 63). The change from 'my' to 'our' also indicates the core value of this story—sharing.

In the pictures, the main participants are the Slodges and the Snawk. The majority of character depictions are [complete] in terms of character manifestation, which allows the readers to quickly understand who is in the picture. The [metonymic: shadow] manifestation of the Slodge only appears four times in this story, three of which occur when the First Slodge is looking at the sun (spread 2-p.3) and moon (spread 2-p.4; spread 10-p.19), and one of which happens when the Second Slodge appears for the first time (spread 4-p.8). The characters' reappearances are mainly [immediate:

unchanged], which means that the main characters appear nearly the same in every picture. This design means that cognitive load is reduced for the readers.

Through comparison, it is noted that the objects (‘natural phenomena’ and ‘entity’) in the text are not considered as participants in the pictures. Only the Slodges and the Snawk are considered as participants in both modalities. Moreover, the pre-modifications in the text (e.g., ‘first’, ‘my’ and ‘our’) are not depicted in pictures as they are hard to visualize. Considering these mismatches between pictures and texts, the post-test will include questions that focus on ‘who (Slodge, Snawk)’ rather than ‘what [e.g. (share) fruit and friendship; (see) the first sunrise]’ to make sure the questions are eliciting ‘participant’ information.

3.3.2.2. Processes

As shown in Table 2, the main process types in the text of this story are relational and material processes. The extensive use of relational processes helps the story to build the concept of ‘belonging’. For example, this text contains many exophoric ellipses (e.g., Clause 4 ‘(It is) My day, my night’; Clause 7 ‘(It is) My star, my moon’ etc.) to indicate that the natural entities belong to the participants. The material processes mainly consist of actions that move the story forward (e.g., Clause 12 ‘pick the first fruit’; Clause 15 ‘took the bite of the fruit’ etc.). Without these actions, the Second Slodge would not appear, the First Slodge and the Second Slodge would not fight, the First Slodge would not be in a dangerous situation, the Second Slodge would not save the First and they would not become friends and share. Thus, these material actions are the core verbs of the story.

Process Type		The First Slodge—Text			
		No.		Percentage	
Material Process		15		23.81%	
Behavioural Process		6		9.52%	
Mental Process		5		7.94%	
Verbal Process		12		19.05%	
Existential Process		3		4.76%	
Relational Process	RAI	3	22	4.76%	34.92%
	RII	17		26.98%	
	Possessive	2		3.17%	
Total		63		100%	

Table 2: The Distribution of Different Types of Processes in the Text

Similar to the text processes distribution, action processes also take dominance in pictures (see Table 3). The transitive actions are realised by using vectors created by body parts. For example, in Spread 2, the arm pointing to the moon and the sun indicates the 'look at' action (see Figure 1); in Spread 8, the vectors created by the mouth indicate the 'went to eat' action (see Figure 2). The intransitive actions are mainly achieved by the lines around the figure. For example, a series of curved lines can indicate that fruit is rolling down a cliff (Spread 7, see Figure 3). The mental perception processes are realized through the gaze vectors. For example, First Slodge's gaze towards the lightening in Spread 3 indicates 'fear' (Figure 4); the Second Slodge's gaze towards the fruit in Spread 4 indicates the 'desire' towards the fruit (Figure 5). The gaze vector, together with the facial expressions of the characters, can make the mental processes more vivid in the pictures than in the text, so the reader can understand the mental processes better.

Process type		The First Slodge—Picture			
		No.		Percentage	
Action	Transitive	21	27	53.85%	69.23%
	Intransitive	6		15.38%	
Mental	Perception	11	12	28.21%	30.77%
	Cognition	1		2.56%	
Verbal		0	0	0	0
		39		100%	

Table 3: The Distribution of Processes in the Pictures

Figure 1. The ‘look at’ Action in Spread 2

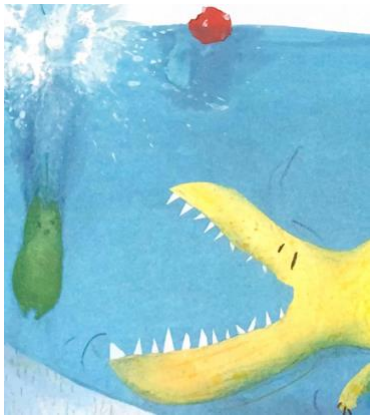


Figure 2. The ‘went to eat’ Action in Spread 8

Figure 3. The Action of Fruit Rolling down in Spread 7

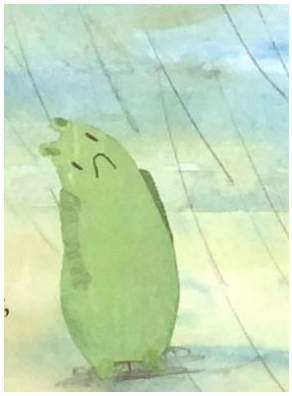


Figure 4. The ‘fear’ Emotion in Spread 3

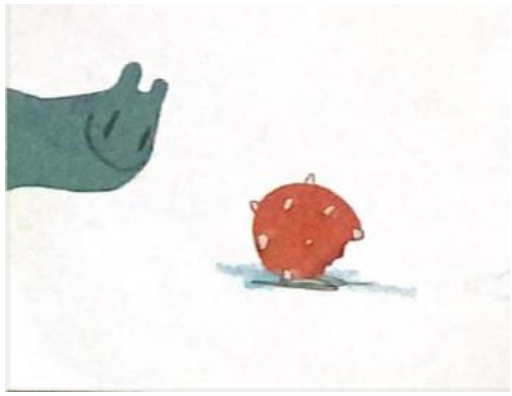


Figure 5. The ‘desire’ Emotion in Spread 4

The above analysis has shown that it is difficult for pictures to depict the relational and existential processes. Only the material and mental processes appeared in both modalities (text and picture) and the action and sensory content are described similar between both modalities. Considering this overlap, the action questions in the post-test

will mainly focus on the material and mental processes to avoid asking participants who are allocated to the picture-only group and the text-only group to answer questions about relational and existential processes that they would not be able to answer.

3.3.2.3. Circumstance

The text of the First Slodge contains very few prepositional phrases. Although simple sentences make the text easier for readers to understand, they also lead to inadequate circumstance information in the text. There are two main types of circumstance in the text: indication of time (e.g. Clause 1 'Once upon a slime'), and the specification of place (e.g. Clause 32 'into the sea'). These environmental prepositions can only provide rough information about the 'when' and 'where' if we only look at the text.

Contrary to the text, pictures have the natural advantage to depict the 'where' information. For example, it is easy to depict the grassland (Spread 1; see Figure 6), the sunset and sunrise scene (Spread 2; see Figure 7) and other environmental information. In addition to the depiction of background information, this book also contains pages without any background (Spread 4, 6; see Figure 8), which is called *Decontextualisation* in Painter et al's modal (2013), which can make the participant and process more noticeable and seems to be a deliberate choice on the author's and illustrator's part.

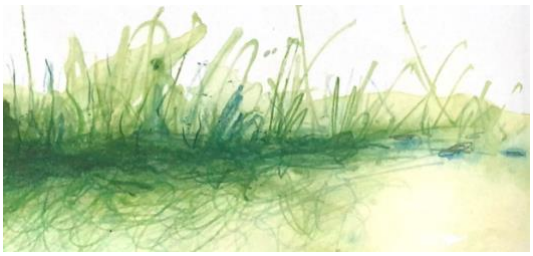


Figure 6. The Circumstance of 'grass land'

Figure 7. The Circumstance of 'Sunset'

Figure 8: Decontextualization Example

After analysis, it can be noted that there is little parallel information in circumstances. In other words, the circumstance of the picture may not be the circumstance of the text and vice versa. For example, the fruit in Spread 8 (p.18, see Figure 9) belongs to the circumstance of the picture. However, the fruit belongs to the participant of the text (Clause 52 'And they shared the fruit'). Thus, the questions in the post-test should ask for information which serves as the circumstance in at least one modality.

Figure 9. The Fruit Serving as Circumstance Information in the Picture

4. Methods

This section will present the methods used to address the research gaps mentioned previously and answer the research questions. Firstly, I will describe the decision of the target group and outline the participant characteristics. Secondly, I will present how the experiment was designed and how the follow-up interviews were implemented. Finally, I will outline how the data was collected and prepared for analysis.

4.1. Participants

Through meetings, the researcher decided to investigate Chinese young beginner-level EFL learners. Once decided on the general target group, the researcher started to seek appropriate primary schools for this experiment. In China, there are two types of schools: private schools held by non-government entities, and public schools held by the government. According to the Ministry of Education of the People's Republic of China (2021a, 2021b), in 2021, there were more than 100 million primary school students in China and only nine million of them are receiving education in private schools. Children in private schools will usually have more language learning resources than those in public schools. For example, public schools start having English lessons from Grade 3, while private schools start from Grade 1. Other resource advantages include having more lessons, better teaching methodologies, smaller classes, and native speakers as teachers. To make the research results more representative of the majority, it was decided that this experiment would be conducted in public schools. After deciding on the school type, the researcher further considered which grade would be appropriate for this experiment. First, the researcher looked at all eight English textbooks (from grade 3 to grade 6) used in public schools. By comparing the vocabulary, grammar complexity, and reading material of the different textbooks and the First Slodge, it was noted that the level of Grade 5 students may be suitable for this research project. This observation was confirmed by asking the English teachers at the target school.

After sending out the recruiting emails (see Appendix B), two public schools in Hangzhou, Zhejiang province showed interest to participate in the experiment. Meetings were arranged with the head teachers and the Principal English Teachers of the schools to talk about the research project in detail. In the end, one school withdrew because of an academic calendar clash but the other school agreed to get involved in the experiment. Grade 5 children in the school, aged 10-11, who were all EFL learners, received the participant recruiting information sheet and the consent form (Appendix C, D, E). The desired sample contained 99 children who were assigned to three conditions using random sampling (Dörnyei, 2007). Thus, the text-only group, the picture-only group and the picture book group all had 33 children. Based on the effect size of previous experiments using the same design (Guo et al., 2020; Levie & Lentz, 1982), a power analysis was conducted by using the G*power 3 program (Faul et al., 2007). According to the results, in total 72 participants would be required to achieve 95% power at the (1-β) =.95 level for main effects (see Appendix N), with three groups and two covariates. Thus, the number of participants in this research was enough for the experiment to be sufficiently powered based on previous similar studies.

4.2. Experiment Design

According to Figure 10, this is a pre-test and post-test experiment with one independent variable, one dependent variable and two covariates. The independent variable was the reading condition that the participants were assigned to (text-only vs picture-only vs picture-text). The aim of designing three conditions was to examine whether different modalities would influence the children's level of information access, and whether the synergy of two modalities can help low-level EFL children understand the story. Children's level of understanding of the story was the dependent variable which was used to measure how much did the child understand the story. The level of comprehension was tested by a post-test. Based on the SFL and MDA analysis of the story, the post-test included three categories of information (participants, processes,

environment) which were tested separately.

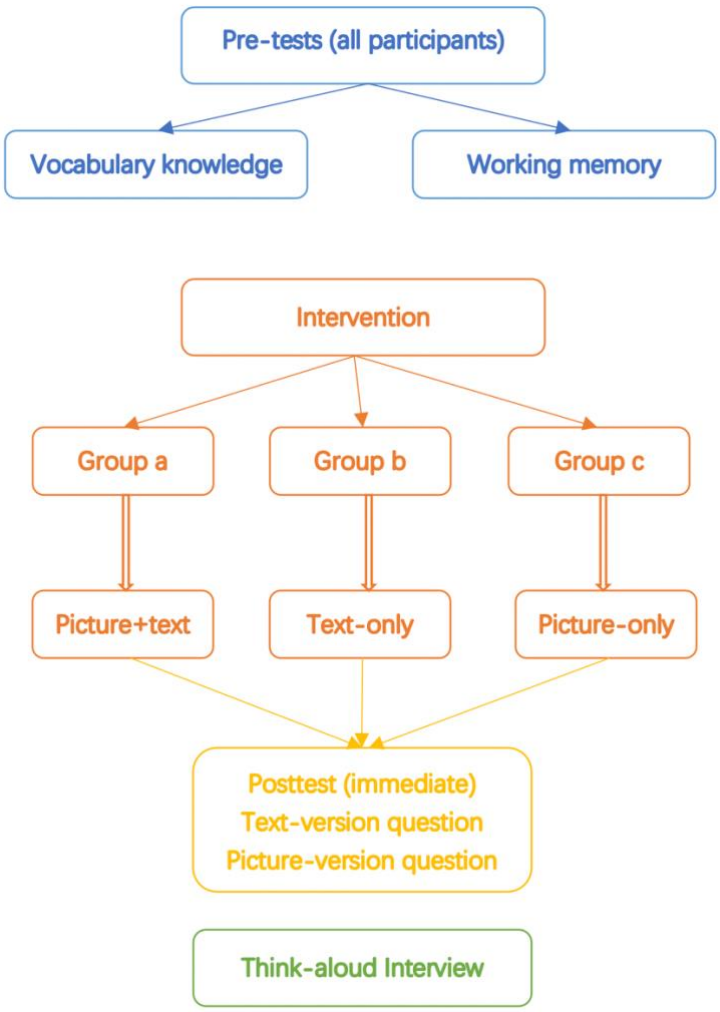


Figure 10. The Key Stages of the Current Experiment

This experiment treated children's vocabulary size and working memory capacity as covariates as these two factors may, and in this study were expected to, impact reading comprehension. According to previous studies (Ibrahim et al., 2016; Laufer & Ravenhorst-Kalovski, 2010; Zhang & Yang, 2016), vocabulary knowledge is an indicator of reading comprehension ability. Controlling it during the statistical tests can help the researcher to better see the impact of the independent variable on the dependent variable. The decision to also measure children's working memory resources was taken as research has shown significant direct effects of working memory on reading comprehension, even with picture books (Arrington et al., 2014; Lepola et al., 2020;

Orrantia et al., 2014; Seigneuric et al., 2000). Also, the two covariates were used to control for children's L2 and cognition levels, which would further indicate that the three randomly allocated groups are at the same cognitive level and that the random allocation procedure worked well in this experiment.

4.2.1. Pre-task Vocabulary Test

This study did not choose to use existing standard vocabulary tests, even the test involving pictures and testing children's receptive skills such as the third edition of the British Picture Vocabulary Scales (BPVS3; Dunn et al., 2009). The main reason was that the original BPVS3 tests listening skills, but reading comprehension requires children's reading vocabulary skills. In other words, children need to match the written word to the corresponding meaning while reading, but the original BPVS3 requires children to match the spoken format of a word to its meaning while listening. Obviously, listening skills were not the target skill of this study. Moreover, BPVS3 was designed for English native speakers. In the current study, EFL learners' vocabulary size was much smaller than native children. The BPVS3 cannot precisely measure participants' vocabulary size. Consequently, I decided to design an original vocabulary test involving pictures and target words to test children's receptive skills.

Considering that the target group is EFL learners, the vocabulary bank of these low-level English learners contains two types of vocabularies: words children have learned in classes or frequently occurring words that they may hear outside the classroom. Thus, the vocabulary test designed for this study contained 30 words (for details, see Appendix F): 10 words from children's textbooks, which they should have already learned, to see whether children have mastered in-class knowledge; 10 words from textbooks that they had not learned (in this case, I chose high-frequency words from middle-school English textbooks), to test whether the children had had extra English input and encountered these frequently occurring words outside the classroom; the final

10 words came from the reading material ‘The First Slodge’ to test not only whether children were at a higher level but also children’s pre-task knowledge of the words in the book, so that the study could control for it.

Moreover, a reading process requires children to match the written words to the corresponding meaning while reading. To make the vocabulary test more appropriate for reading, the vocabulary test used in this study presented both written words and pictures to children. Children would simultaneously receive 10 pictures and 10 words, and they would need to match the words to the pictures. Providing pictures and words simultaneously means participants can finish the task without talking, so sessions with multiple participants could be conducted simultaneously, which is time-saving for data collection.

4.2.2. Working Memory Pre-test

This study used a digit span test (forward version) to test participants’ working memory. The researcher showed participants videos (recorded from https://timodenk.com/blog/digit-span-test-online-tool/) containing strings of numbers. There was one digit showing on the screen per second. Participants needed to remember the digits according to their sequence and wrote the digit strings down on a given paper after the video. The test started from four digits; every time participants got the correct answer, the digit string would be increased by one digit until the participants got two incorrect answers.

4.2.3. Intervention—Reading Materials

The story of The First Slodge was re-designed by me into three versions corresponding to three conditions: the text-only version, the picture-only version (text erased using photoshop) and the original picture book version. (I am unable to include these reading materials in the appendices for copyright reasons. Please refer to the original

publication if you would like to see the full story).

After double-checking with school English teachers, it is confirmed that the target group can generally understand the story content, but G5 children have not learned the past tense and some of the words. To address the grammar issue, I changed the past tense to the present tense. For the unknown words, the researcher asked three G5 children to read the story and underline words that they do not know during piloting. 25 words were underlined at least by one of the three children, which corresponded to 9.03% of the total words in this story. According to Nation (2006) and Hsueh-Chao and Nation (2000), adequate comprehension can be achieved only when 95% to 98% of words of the text were known by the reader. If all 25 unknown words were left in the text, most of the participants would be unable to gain an adequate understanding of the story. Thus, the researcher gave Chinese annotations to some of the unknown words to help children understand the story. Other 11 unknown words (see Appendix H) were left unchanged deliberately to see whether children can guess their meaning based on different modalities.

4.2.4. Comprehension Post-test

The post-test questions focused on the three parts of experiential meaning: participants, processes, and circumstance. Considering participants' age, it was decided that the comprehension test would contain 15 multiple-choice questions. Five process questions mainly asked for the 'did' (action) information happen in both pictures and texts. Five participant questions asked 'who' and 'what' information. Five circumstance questions asked about 'circumstance' information. Asking questions according to information types allowed the researcher to investigate which type of information is easy/difficult for EFL beginners to acquire, and whether pictures or texts can help EFL beginners to better acquire information about participants/processes/circumstances.

For the 5 action questions and the 5 participant questions, the researcher chose to ask information that served as participants or processes simultaneously in both modalities (text and picture). For example, the word 'smell' in Clause 11 served as an action in the text, the 'smell' action was illustrated on the same page (p.6). However, according to the SFL and MDA analysis, the information about circumstance is not parallel across modalities. Thus, for the five circumstance questions, the researcher chose to ask for information which is at least captured as the circumstance in one modality. Asking information appeared in both modalities can make sure that each group would not encounter information that they had not read.

Considering the involvement of two modalities (text and picture), each question was asked in two ways: in a text version and a picture version. The picture version provided participants with a picture but asked the same information as the text version questions. Participants from the text-only (TO) group received the text-version questions, and the picture-only (PO) group received the picture-version questions. Participants in the picture book (PB) group would receive a test with 8 text-version questions and 7 picture-version questions as the PB group would read both text and picture modality during the intervention. The post-test question format is illustrated in Figure 11 (for the full post-test materials see Appendix G). Each question contains four choices: one correct choice (marked in red in the figures), one irrelevant choice (in green) and two relevant but incorrect choices (in orange). The text-version questions and the picture-version questions would contain the same four choices. The irrelevant choice helped the researcher exclude the data from children who were guessing the answer (more details about data exclusion will be provided in Section 4.5).

Action Question 1:

What does the First Slodge do with the flower?
The First Slodge 对小花做了什么？

A: pick
B: smell
C: look at
D: work

What does the First Slodge do with this picture?
第一个 Slodge 对图上的东西做了什么？

A: pick
B: smell
C: look at
D: work

Participant Question 1:

Who takes the first bite of the fruit?
谁咬了第一口水果？

A: The First Slodge
B: The Second Slodge
C: The Snawk
D: Sister

Who bites the thing in this picture?
谁咬了图片上的东西？

A: The First Slodge
B: The Second Slodge
C: The Snawk
D: Sister

Circumstance Question 1:

What does the first slodge see for the first time at night?
Slodge 在晚上第一次看到了什么？

A: star and moon
B: pen
C: plane
D: cloud

What does the first Slodge see in this picture for the first time?
第一个 Slodge 在这张图里第一次看到了什么？

A: star and moon
B: pen
C: plane
D: cloud

Figure 11. Example Action, Participant and Circumstance Question

4.3. Think Aloud Interview

The follow-up interview was based on the 11 unchanged and, very likely, unknown words mentioned in 4.2.3 and Appendix H. The goal of designing the think-aloud interview after the experiment was to help the researcher get more information about how the two modalities help children infer the meaning of unknown words.

During the interviews, the researcher provided children with the picture book (in both modalities) and guided them to answer questions about the 11 words (question details see Appendix Q). The questions were repeated 11 times in each interview session, and the interviews were video recorded to help the researcher locate where the children were pointing (text or pictures). Also, as children were guessing the meaning during the interview, the researcher read the text aloud to help children locate the word that was being asked and help children take the contextual information into consideration. Where necessary, such as when children were directly asking for a translation of the contextual information, the researcher would translate the contextual information to Chinese. This action stimulated children's guessing and made the interview more fruitful.

Finally, 10 children participated in four interviews (2 groups 1-to-2 children; 2 groups 1-to-3 Children). Among the 10 participants, 4 children came from the PO group, 3 children came from the TO group and 3 from the PB group. The interviews were not in one-to-one format because, first, many children wanted to re-read the picture book after the experiment since they liked and enjoyed it. Second, children from the PO and TO group who were only reading in one modality had also shown huge interest in reading the original modal. Third, the researcher and the children were not very familiar with each other and attending the interview with a friend would make the children more willing to talk.

4.4. Procedure

After gaining ethical approval from the Central University Research Ethics Committee of the University of Oxford (Appendix A) and designing the initial experiment materials, the experiment was piloted and then administered to the target children.

4.4.1. Ethic Issues and Obtaining Consent

Before the experiment, the school sent out the Information Sheet for parents (Appendix C) and the Consent Form (Appendix E) to parents and the Information Sheet for children (Appendix D) to the children. Parents who agreed for their children to participate signed the consent form and returned it to the school, and the school gave it back to the researcher. Apart from the consent form, children were also asked for assent before the experiment.

4.4.2. Piloting

Piloting was necessary for this study as experiments in this format (SFL and MDA based) and with the target group (Chinese EFL beginners) are limited. The pilot was conducted after the initial material was designed. The three participants of the pilot came from the same school as the actual participants. The whole experimental procedure was followed to evaluate the experiment materials. After the experiment, the three participants were asked to underline the unknown words of the story to help the researcher install annotations (also mentioned in 5.2.3).

The results of the pilot lead to some changes in the experiment material and procedures. Firstly, the pilot suggested that the unknown words disturbed children's comprehension of the story. For this reason, the researcher decided to provide the Chinese annotation to some of the unknown words.

Secondly, the original vocabulary test adopted a listening--multiple-choice format. The

researcher realized a gap between the original test and how vocabulary is recognized and understood during reading; thus, the vocabulary test changed to the format described in the previous section. Moreover, the experiment was designed for 1-to-3 (one researcher, three participants) administration, but the original vocabulary test had to be administered in 1-to-1 format. Not only was the initial version time-consuming, but the other two children who did not take part in the test but were still in the room were also influenced by the ongoing test as the second and the third participant would listen to the vocabulary more than once. The matching activity developed after piloting allowed three participants to do the activity simultaneously, saving time and hindering the disturbance.

Finally, the working memory test was initially done using a tool from a website. However, using the website posed challenges to time and response accuracy control. To be more specific, the researcher needed to record the answers, invigilate the participants, and control the website simultaneously. It turned out that the researcher was unable to record the correct answer when the digit span test turned to more than 7 digits as one second per digit was too fast for the researcher to note the sequence down. To solve this problem, the researcher video recorded the tests, not only to save time, but to make sure that she had access to the correct answer for each digit span sequence.

4.4.3. Administration

The data collection took place a few days after the piloting and the change of materials. Every session of the experiment was completed in the following order:

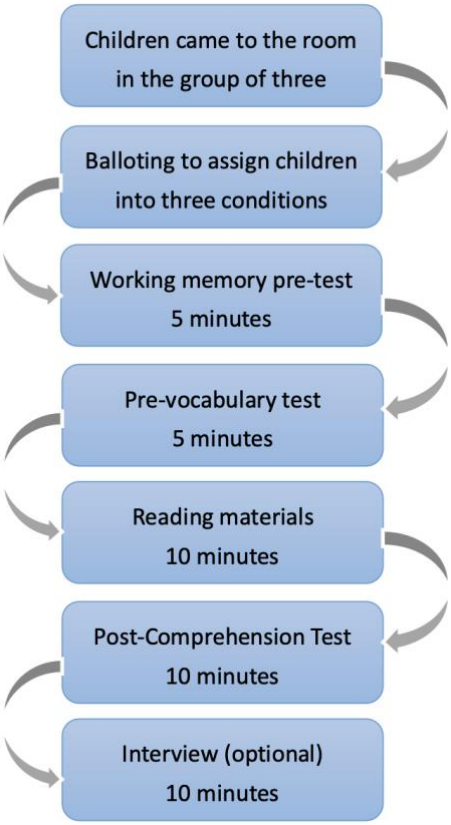


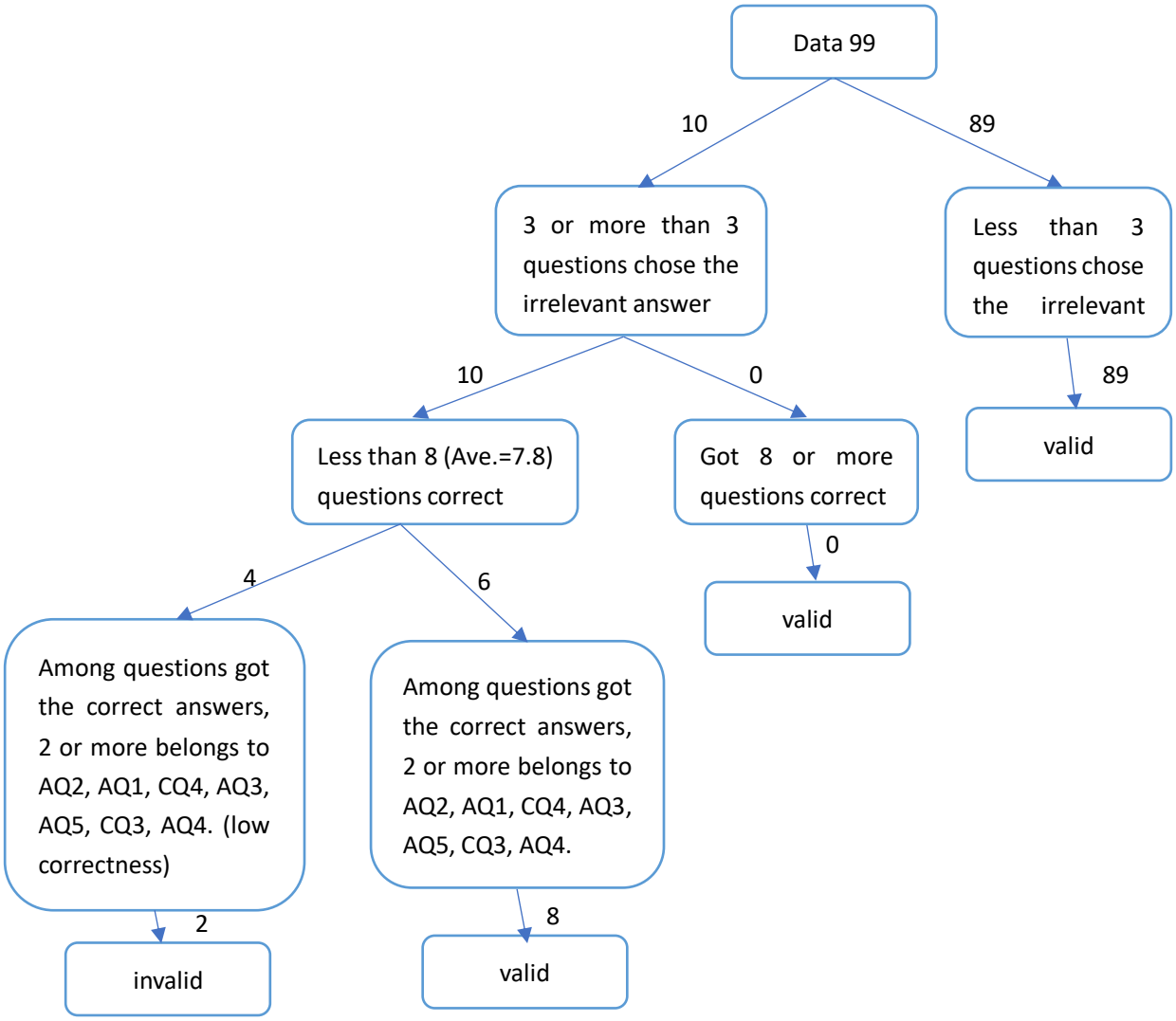
Figure 12. The Procedure of Data Collection

All sessions of the experiment took place in a quiet reading room which was separate from the main teaching building. The experiment happened in two time periods: nap time, and after-class self-study time. During these two periods, the children did not have classes so the experiment would not affect the normal school activities. After the experiment, every child was given a book marker or a notebook as a present for their participation.

4.5. Preparation for Data Analysis

Preparing the data for analysis involved two main procedures: the calculation of the experimental data and the transcription of the qualitative interview data. As the interview focused mainly on the content rather than on the paralinguistic information, the recordings did not need to contain very detailed transcriptions, such as intonation markers or the stops. However, children's pointing to both text and pictures were noted

alongside the language content. The researcher transcribed four interviews into four tables (see appendix R) including information such as whether children inferred the correct meaning, which modality served as reference, what were the children's original responses and English translations. For the experiment data, this study used raw data for all three pre- and post-tests. The data was imported to SPSS for statistical analysis. Another important step in the data preparation process was the exclusion of invalid data. To do this, I designed the following flow chart to sort the data:



AQ=Action Question

PQ=Participant Question

CQ=Circumstance Question

Figure 13. Invalid Data Exclusion Criteria and Procedure

5. Results

In this chapter, I will report the results of my experiment and interview. I first checked the normality of the data distribution and the homogeneity of the group variances to ensure that the following statistical tests [Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), Regression and t-test] could be carried out (see Appendix O, P for details). I also checked the validity of random allocation by conducting two one-way ANOVA tests on the results of the pre-test. The results showed that there was no significant difference among the three groups in the results of the pre-vocabulary test [$F(2, 94) = .675$, $p = .512$] and working memory test [$F(2, 94) = 1.692$, $p = .190$], suggesting that the three groups were identical in terms of language level and cognitive level.

5.1. Picture, Text and Reading Comprehension

To investigate the usefulness of pictures, the comprehension post-test results of three groups [the Picture book (PB) group, the Picture-only (PO) group, the Text-only (TO)] group were compared. Overall, there is a mild descriptive difference among the three groups, and the PB group seemed to perform slightly better than the other two groups. The post-test scores of all three groups were not high: the PB group scored [$M(PB\_all) = 8.18$, $SD = 3.015$] out of 15 questions; the TO group scored [$M(TO\_all) = 7.84$, $SD = 3.226$]; and the PO group scored the lowest [$M(PO\_all) = 7.64$, $SD = 2.396$]. Table 4 depicts the mean scores of the three groups in 5 Action questions, 5 Participant questions and 5 Circumstance questions respectively (the above mean score for each group is the addition of the means of all subcategories shown in Table 4). If we look at the questions for different information types, not many obvious descriptive differences were found between the three groups answering different types of questions. The PB group performed better than the other two groups in answering the action questions and the participant questions but performed least well on the circumstance questions. The PO group scored lowest in the participant questions but

highest in the environmental questions.

Question types	Mean		Standard Deviation	
	PB	1.94	PB	1.273
Action	TO	1.90	TO	1.274
	PO	1.42	PO	0.902
	PB	3.42	PB	1.146
Participant	TO	3.00	TO	1.732
	PO	3.15	PO	1.349
	PB	2.88	PB	1.293
Circumstance	TO	2.94	TO	1.093
	PO	3.06	PO	1.197

Table 4. Mean Scores of the Action, Process and Circumstance Questions

To further investigate whether different conditions affect the children's responses to the post-test questions, I administered ANCOVA tests. ANCOVA test allowed me to examine the statistical difference in post-test performance across groups while controlling for two covariates: vocabulary knowledge and working memory, which have been identified as factors influencing picture book reading comprehension in previous studies (Arrington et al., 2014; Lepola et al, 2020). Four ANCOVA tests were administered here, one to test the differences between the three groups in the overall post-test, and the other three to test the differences between the three groups in their responses to questions about three different types of information (action, participants, circumstance).

Vocabulary knowledge was found to have a significant predictive effect on the outcome measure ($p<.001$) and exhibited a large effect size ($\eta^2p=.298$), while the working memory was not significantly impacting the post-test results ($p=.786$, $\eta^2p=0.01$). Therefore, I also present the adjusted means (means that are adjusted by controlling and minimizing the variance attributed to the covariant; Clason & Mundfrom, 2012) of the post-test for all groups in Table 5 and 6. I presented a line chart (Figure 14) of the adjusted means to better present the group difference. According to the following tables,

the PB group had the highest adjusted mean in the whole post-test (15 questions), the 5 action questions and the 5 participant questions, but performed poorly in the 5 circumstance questions.

Group	Adjusted Mean	Standard Deviation	N
PB	8.365	0.427	33
TO	7.592	0.445	31
PO	7.598	0.429	33

Table 5. Adjusted Means for the Three Groups after Controlling the Covariates

Question types	Adjusted Mean		Standard Deviation	
	PB	1.976	PB	0.197
Action	TO	1.833	TO	0.206
	PO	1.454	PO	0.198
	PB	3.495	PB	0.227
Participant	TO	2.896	TO	0.237
	PO	3.178	PO	0.228
	PB	2.953	PB	0.174
Circumstance	TO	2.862	TO	0.182
	PO	3.056	PO	0.175

Table 6. Adjusted Mean Scores for the Action, Process and Circumstance Questions

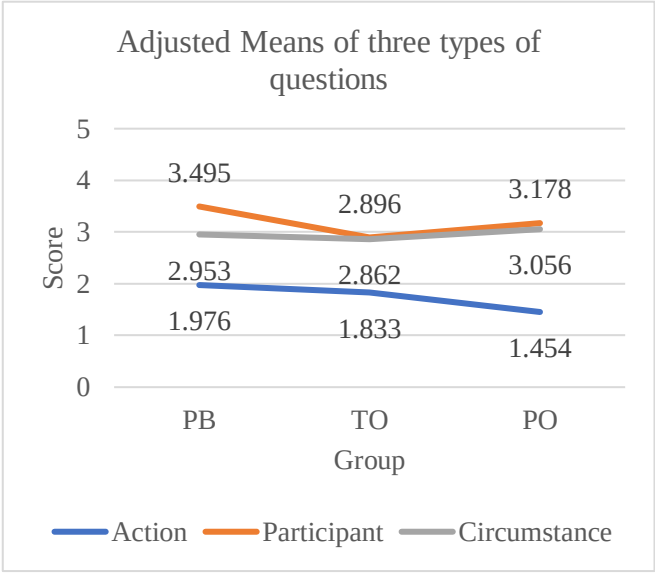


Figure 14. The Line Chart of Adjusted Means for the Action, Process and Circumstance Questions

However, even though the PB group performed better than the other two groups on most post-test questions, no significant results were shown on the four ANCOVA tests [for all 15 post-test questions: $F(2, 94) = .959$, $p = .387$, $\eta^2p = .020$; 5 Action questions: $F(2, 94) = 1.858$, $p = .162$, $\eta^2p = .039$; 5 Participant questions: $F(2, 94) = 1.663$, $p = .195$, $\eta^2p = .035$; 5 Circumstance questions: $F(2, 94) = .291$, $p = .748$, $\eta^2p = .006$]. This means that picture books could not help children perform significantly differently on any type of questions relative to the other two groups of children who received only pictures or text materials.

Although the ANCOVAs revealed that pictures could not assist participants to perform significantly better on the post-test, participants in the PB group seemed to perform differently in answering text-version questions and picture-version questions. To this end, I conducted a paired t-test to examine the existence of statistical differences. The results suggested that the mean score of picture-version questions was 4.52 (SD=1.734) (out of 7 questions), and the mean score of text-version questions was 3.67 (SD=1.689) (out of 8 questions). The paired t-test showed a significant difference [$t(32) = 2.871$, $p = 0.007$, $d = 1.698$] between picture questions and text questions, suggesting that participants in the PB group were significantly better at answering picture questions than text questions. Thus, readers may understand the picture information better than the textual information, indirectly indicating the positive role of pictures in reading comprehension.

5.2. The Acquisition of Different Types of Information (action, participant and circumstance)

Having noticed that pictures did not play a significant role in answering either type of information, I conducted repeated ANOVAs to figure out whether the type of information played a role in the post-test. The reason for choosing repeated ANOVAs was because they allowed me to examine whether the whole dataset and three separate

groups performed differently in answering three types of questions (Action questions, Participant questions and Circumstance questions).

ANOVA results indicated that there was a significant difference between participants' performance on the action question and the circumstance question [$F(1, 96)=74.490$, $p<.001$, $\eta^2p=.437$], and between action questions and participant questions [$F(1, 96)=80.177$, $p<.001$, $\eta^2p=.455$], but not between circumstance questions and participant questions [$F(1, 96)=2.733$, $p=.102$, $\eta^2p=.028$]. These statistics showed that all participants, regardless of the condition to which they were assigned, were able to answer the circumstance and participant questions significantly better than the action questions. In other words, compared to circumstance and participants, the action information may be the most challenging part for participants to locate and understand in this experiment.

The information type also played a vital role in the post-test performance of the three groups. According to Table 7, repeated ANOVA tests showed that only the TO group [$F(1, 30) = .047$, $p=.829$, $\eta^2p=.002$] and the PO group [$F(1, 32) =. 139$, $p=.712$, $\eta^2p=.004$] groups did not show significant differences in their responses to the participant and circumstance questions; however, the PB group was statistically different in their responses to these two types of questions [$F(1, 32)=7.448$, $p=.010$, $\eta^2p=.189$], indicating that accessing to participant information was even easier and better than accessing to circumstance information for the PB group. In addition to this, several other comparison pairs (participant vs. action, circumstance vs. action) showed significant differences among all three groups.

Group	Info_type	df	F	Sig.	Partial Eta Squared
PB	Participant vs. Action	1	42.923	<.001	.573
	Circumstance vs. Action	1	11.666	.002	.267
	Circumstance vs.	1	7.448	.010	.189

	Participant				
TO	Participant vs. Action	1	12.333	.001	.291
	Circumstance vs. Action	1	25.430	<.001	.459
	Circumstance vs. Participant	1	.047	.829	.002
PO	Participant vs. Action	1	34.795	<.001	.521
	Circumstance vs. Action	1	52.719	<.001	.622
	Circumstance vs. Participant	1	.139	.712	.004

Table 7. Repeated ANOVA Test Results of Different Information Types among the Three Groups

5.3. Vocabulary and Picture Book Reading

To investigate the relationship between vocabulary and picture book reading, I first conducted regression tests to see the role of pre-vocabulary knowledge on post-test performance. I then asked several children how they inferred the meaning of unknown words using the think-aloud interviews to find out which modality the children relied more on when using picture books to learn new words. In the following sections, I will access these results in detail in an attempt to answer this research question.

5.3.1. Regression Test Results

In previous ANCOVA tests, the statistical results have shown that pre-vocabulary knowledge is a significant predictor of post-test performance and had therefore been controlled for. Here, regression tests seek to further investigate how much of the variance can be predicted by the vocabulary.

The first general linear regression test was conducted on the whole dataset. The regression model produced to account for the post-test performances, with vocabulary as the predictor, was a good fit, which explained the 29% of the variance and led to the vocabulary being a significant predictor [R^2=.290, $F(1, 96)=38.744$, $p<0.001$]. The regression analysis also showed that children's higher score on vocabulary test was associated with better performance in the post-test.

Having known that vocabulary is a significant predictor, how about its role in different conditions? To answer this question, I further split the file and ran three general linear regressions. According to the regression results, vocabulary could explain 28.1% of the variance in the PB group [R^2=.281, F(1, 32)=12.094, p=0.002]; 34% of the variance in the TO group [R^2=.340, F(1, 30)=14.941, p<0.001]; and 28.8% of the variance in the PO group [R^2=.288, F(1, 32)=12.513, p=0.001]. This means that, in all three conditions, vocabulary in the TO group was a stronger predictor when compared to the other two conditions.

5.3.2. Think-aloud Interview Results

In this section, I will present the qualitative interview results. I will first demonstrate children's previous vocabulary knowledge of the 11 words to ensure that participants were making inferences. Next, I will present the main findings according to the transcription and analysis of the interviews. Finally, I will compare the interview results to the post-test results to examine whether there is a difference between explicit and implicit vocabulary learning.

5.3.2.1. Previous Knowledge towards the 11 Words

The think-aloud interview asked how children inferred the meaning of unknown words through reading the picture book. Before analyzing the think-aloud content, I would like to present children's previous knowledge of these 11 unknown words by presenting the results of the vocabulary pre-test. The children scored an average of 1.66 on the pre-test containing 9 of the 11 words to be asked about in the interview, suggesting that they had very little previous knowledge of the words. I also checked the children's knowledge before each interview session by showing them 11 words and asking if they could recognize the meaning. Children's responses confirmed that they had very little previous knowledge. It can therefore be argued that when children inferred word

meanings during the interviews, they relied on information provided by picture books and other background information rather than previous vocabulary knowledge.

5.3.2.2. The Interview Analysis

After transcribing the interviews into the table in Appendix R, I calculated the children's performance in inferring meaning and summarized the resources on which they relied. Table 8 shows the number of correct, relevant and incorrect guesses of each interview session. These results reveal that children would get the meaning of most unknown words if they were guided to use the information provided in the picture book.

Correctness	Session 1		Session 2		Session 3		Session 4	
	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
Correct	6	54.54%	6	54.54%	7	63.63%	9	81.81%
Relevant	2	18.18%	3	27.27%	2	18.18%	2	18.18%
Incorrect	2	18.18%	2	18.18%	1	9.09%	0	0%
Learned	1	9.09%	0	0%	1	9.09%	0	0%
Total	11	100%	11	100%	11	100%	11	100%

Table 8. The Number of Times for the Correct, Relevant and Incorrect Inferences of the Meaning of Words in the Four Interview Sessions.

I further analyzed the information children referred to when generating their guesses. Several findings emerged. Firstly, children relied most on picture resources. According to Table 9, across all four interview sessions, children accessed picture resources 33 times, while referring to textual resources 22 times. Especially for concrete words, such as 'sunset', children could easily get the correct meaning by referring to pictures. However, for words that cannot be expressed straightforwardly by pictures, for example, 'bite' (presented by depicting a fruit with a piece missing); children needed to put more effort in guessing the meaning through pictures. In other words, children needed to mobilize more of their multiliteracy skills to infer the words.

Words	Picture reference				Text reference				Other references			
	Session 1	Session 2	Session 3	Session 4	Session 1	Session 2	Session 3	Session 4	Session 1	Session 2	Session 3	Session 4
Universe												
Sunset												
Sunrise												
Thunder												
Lightning												
Bite												
Shock												
Fight	*				*				*			
Splash												
Scare away			*				*				*	
Furious												

* means learned words

means children were using the reference

means children were not using the reference

Table 9. References Children Made During the Guided Think-aloud Interview

Secondly, children would also refer to the text information although they were novice learners. Morphological knowledge was one of the resources that children frequently accessed. For example, although children did not know the meanings of the words 'sunset' and 'sunrise', they managed to guess the meaning by saying '(I knew) the English word 'sun' means '太阳(sun)' in Chinese, and (I knew) 'set' means 'go down', and 'rise' means 'go up'. Children would also use their grammatical knowledge to support their guesses. For example, for the word 'lightning', one child said that 'light' means bright and 'ing' indicates the ongoing tense, so the light often occurs on a rainy day should be '闪电(lightning)''. The use of morphological knowledge and grammatical knowledge is more demanding than simply understanding the pictures, especially for beginning learners. As a result, children used these types of textual knowledge much less often than they used picture references. Apart from morphological knowledge and grammatical knowledge, contextual information about

the story was also a type of resource that children would rely on. For example, when children were guessing the meaning of ‘furious’, they would say that ‘because here the First Slodge is going to be eaten by the Snawk, the Second Slodge should feel afraid, so it comes to save the First Slodge’; when children were guessing the meaning of ‘shock’, they would say ‘because it is their first meeting, (so they feel shocked)’. This contextual information also required children to at least understand the story, either by looking at the pictures or the text.

In addition to the pictures and the text, the children would also rely on previous knowledge to guess word meanings. One type of prior knowledge is world knowledge. For example, in guessing the meaning of 'thunder', children would say ‘thunder and lightning always occur together’; ‘lightning is bright at the moment it strikes’; ‘when lightning is present, it brings light’. Children would also use their prior English vocabulary knowledge, especially to self-correct or rebut other people’s wrong guesses after making wrong guesses. Such as, when guessing the meaning of ‘bite’ in Interview 1, one child thought it meant '爬(climb)'. Another child immediately rebutted that the English word for '爬’ is ‘climb’, not ‘bite’. This type of previous knowledge helped the children to rule out possibilities and approach the correct meaning of the word. Interestingly, children would also refer to their Chinese language knowledge and literature knowledge. For example, when guessing the meaning of ‘sunset’, the picture showed the sun hiding behind the mountains. One child said ‘太阳(sun)下(down)山(mountain)’. In Chinese, ‘太阳(sun)’ and ‘山 mountain’ is a collocation that frequently occurs together. When Chinese users want to express the concept of ‘sunset’, they would usually say ‘太阳下山(the sun went down behind the mountain)’. In terms of literature knowledge, one child mentioned that, when depicting the environment in literature, authors tend to start with a large scope and then zoom (Interview 1). Thus, when guessing the meaning of ‘lightening’, he told me that the ‘previous page said that it (the First Slodge) has seen his first sunrise (which is big scope), then depicting the

lightning in a rainy day (which is from a small scope)'. These various types of prior knowledge can help children refer back to their own experiences and add their thoughts to this story.

Although the interview results revealed that children primarily rely on pictures, text and prior knowledge, it is necessary to emphasize that successful guessing of word meanings seems to be the result of the synergy of these three types of information (picture, text, prior knowledge), rather than of using the resources in isolation. The children would always use more than one type of resource to help them either guess or confirm the meaning of the unknown words. For example, in interview 2, when the children were guessing the meaning of 'lightening', 'bite', and 'shock', they used all three types of information to infer the meaning. Even when children were only using one type of reference, they mobilized a wider range of knowledge: children would not recognize the shape of 'lightening' if they had never seen it before, either in the real world or in artworks. The invocation of this knowledge is tacit, and difficult to recognize because it is taken for granted, but it appears to be a very important part of the thinking process.

5.3.2.3. Incidental Vocabulary Learning

How well do children recognize words after incidental exposure to the picture book, without any guidance? Although this experiment did not intentionally measure children's incidental word learning, the post-test contained five questions related to the unknown words. Children seemed to not perform well on most of these questions containing those unfamiliar words. Table 10 presents the percentage of children who answered these five questions correctly and the rank of correctness rate among all 15 questions.

Question No.	The unfamiliar word that the question was asking	Correctness rate	Rank of correct rate
Action Question 2	bite	19.2%	15th
Circumstance Question 4	shock	28.3%	13th
Action Question 3	fight	32.2%	12th
Circumstance Question 3	splash	49.5%	10th
Participant question 3	scare	71.7%	2nd

Table 10. The Correctness Rate of Post-test Questions Related to the Unknown Words.

According to the table above, after reading without any extra support, participants performed poorly in answering most of the questions related to unknown words in the post-test, suggesting that the incidental exposure may not assist children effectively to infer the meaning of unknown words and understand the content about action and circumstance. It is important to emphasize that no conclusions can be drawn according to these fragmented data, as this experiment did not intentionally measure children's knowledge about these words after the intervention. However, these observations contrary to the interview results can provide clues towards the efficiency of incidental learning. That is, incidental learning through reading picture books may not function as effectively as picture book reading plus guided think-aloud activities.

6. Discussion

The experiment and interview results in the last section can provide possible answers to the three research questions posed at the beginning of this paper. How then can these results be understood, interpreted and discussed? In the following sections, I will revisit and interpret previous statistical and interview results and place them in a larger context.

6.1. Picture, Text and Reading

Based on the results of four ANCOVA tests, picture books did not appear to help beginning learners of English to better understand the content of the stories, the participant, the action, and the circumstance information in 'The First Slodge' in this experiment. The results of this experiment are different from most of the findings of previous research on picture book reading comprehension, and contrary to our expectation that the picture book group can perform significantly better than the other two conditions receiving only one modality (text or picture).

However, our findings are consistent with those of Mounguengui and Ilouga (2019), and Eng and Chandrasekaran (2014), who also noted a non-significant result of pictures on reading comprehension, suggesting the picture book may not be as useful as advocated by previous studies. Mounguengui and Ilouga (2019) argued that a lack of world knowledge could lead to this non-significant result, as understanding cannot be enhanced and reinforced by pictures due to a lack of relevant knowledge (Gyselinck & Tardieu, 1999). However, a lack of world knowledge may not be the case in the current study. The story 'The First Slodge' is a story prepared for children aged 3-7, while the ages of participants were 10 to 11. If we turn to the content, the story contains information that children would be exposed to on a regular basis, such as the weather, and the 'sharing' theme. Furthermore, children were using their prior knowledge in interviews to infer the meaning of unknown words. Therefore, participants should have had sufficient prior knowledge when reading this book.

How, then, can the lack of significant differences in the results of this study be explained? The most possible reason is the English language level of the participants. Given that these pupils are beginning learners, their knowledge base in English is relatively limited, so it is likely that these children were able to understand the story but could not answer the post-test questions correctly. If we look at the design of the post-test, which is organized by types of information, it is obvious that the children need to know at least the English word of the correct answer to get a point for a question. For action questions, children did not only need to comprehend the action and match it to prior and world knowledge, but also to correctly recognize and locate the corresponding verb, or to exclude the incorrect verbs among the four choices, at the very least. However, as children did not know these corresponding English words, they could not answer the questions correctly.

Another informal evidence in support of the lack of English knowledge was that participants could discuss the story with the researcher in Chinese after the experimental session. They were always right about the theme of the story (sharing), but, when it came to the details, the children did not always do a good job of stating them correctly. In other words, the children could not match their understanding to their English representations, thus they performed poorly in the post-test questions. Also, lack of English linguistic knowledge would deter children from generating correct guesses. Many of the things that advanced learners take for granted, such as judging the part of speech of a word based on where it occurs in the sentence, were not easy for them to refer to. For example, in the sentence ‘it was a terrible shock to both of them’, advanced learners can deduce that ‘shock’ is a noun because it follows the article ‘a’, and the adjective ‘terrible’; however, for beginners, this process can be challenging for them. So, children’s English knowledge may affect their performance when answering the post-test questions.

When children cannot gain enough information from the text, they turn to pictures. This situation would often occur with children whose English language skills were too limited to understand sentences. However, although the nature of pictures has the advantage to depict concrete and static information such as facial expressions and participant features (Painter et al., 2013; Wu, 2014), pictures also have inherent disadvantages in describing some of the active actions and changes, such as temporal changes that are part of environmental information. For example, the verb 'dream' was indirectly illustrated by depicting a dream bubble. Children may not have noticed this detail, or even if they had noticed the dream bubble, they would not necessarily have understood it as 'dream'. Therefore, if children rely solely on pictures, they can only understand partial information may not be able to obtain the information accurately (Roberts & Brugar, 2017, see Section 2.2.1.2). The post-test also contained questions that required children to understand the sequence of the actions which were difficult to depict. For example, action question 5 asked 'what do the two Slodges do to the fruit **after** the Second Slodge saved the First?'. Apart from the natural disadvantage of pictures conveying certain types of information, according to the semiotic-oriented study results (e.g. Nikolajeva & Scott, 2000, 2006), the information conveyed by the text and picture may not parallel with each other. Thus, a single modality cannot provide as full information as two modalities. Although the post-test was designed to ask for information that occurred in both modalities, children who are in the PB group but had actively chosen to rely on only the picture modality would have gained less information.

Apart from relying merely on pictures, the researcher also noticed situations where PB group children read only textual information during the experiment and the researcher needed to repeatedly remind them to look at both modalities. This often happened with participants who were relatively good learners of English, enjoyed learning English

and/or were confident in themselves. That is, children who were good students. They were eager to read the text, to recognize new English words and expressions, and to prove that they could understand the story. However, there were still words in the stories that they could not understand or grammatical knowledge that they had not learned, which could also affect their access to and understanding of information. Since some children in the PB group chose to rely more on one modality, they were in a very similar situation to the TO and PO group. It is not surprising, therefore, that the results of the PB group were not significantly different from the TO and PO group.

When excluding the previous two situations (where the children chose to only rely on the text or picture modality), a third possible reason for the non-significant results emerges, namely that the children may have failed to make the correct connections between the text and the pictures. In other words, children who have read both modalities may not use one modality to support the other to understand the story accurately. This possible reason is in line with Gerber et al's (1995) finding that younger readers may consider the picture components in isolation rather than in conjunction with the text (see Section 2.2.1). For example, children might have seen the 'shock' face in the picture, but without additional support, they were unable to match the 'shock' face of Slodge with the English word 'shock'. Two modalities, the pictorial form and the verbal form, might have increased the children's cognitive load and memory load. With limited reading time due to the experimental context and limited capacity due to developmental reasons, it is understandable that children do not have the extra attention span to match pictures with the corresponding words or vice versa.

According to some previous results (e.g. Eng & Chandrasekaran, 2014; Mounguengui & Ilouga, 2019) and the ANCOVA tests of this experiment, it seems that adding pictures to a text may not always help language learners to gain more information in the present experiment. Does this mean that pictures have no role in reading? The answer is that it

has some role in reading, according to the results of this study. The T-test testing whether children in the PB group performed differently in answering text-version and picture-version questions showed that PB participants performed significantly better in answering picture-version questions than text-version questions, suggesting that children who read picture books gained more information from pictures than from text. Although this t-test cannot reveal why picture information was easier to access than textual information, this significant result indirectly acknowledges the value of pictures in reading comprehension and information acquisition. Having noted the difference between picture information acquisition and textual information acquisition, further research is therefore necessary to identify the reasons for the differences between the text and picture modality.

6.2. Information Types and Picture Book Reading

Investigating whether children perform differently in acquiring different types of information is an original part of this study and has not been done in previous studies. Based on the repeated ANOVA results, overall, the three groups performed significantly better in answering participant and circumstance questions than action questions. This result implies that action information was the most difficult type to obtain from reading the experimental materials for all participants, regardless of the condition they were assigned to. Action information, or verbs, is the most critical information of a story, which is also evidenced by the SFL analysis results in Section 3.3.2.2 that actions are the information type that drives the current story forward. As argued in Section 6.1, children's limited knowledge of these verbs did not allow them to answer the questions correctly. For the TO group, the inadequate verb knowledge would prevent them from understanding the actions, matching them to world knowledge, and answering action questions correctly. In other words, readers in the TO group would have problems understanding action verbs at the very beginning of the input phase. For the PO group, children might understand the action, but had problems

finding the correct answers when taking the post-test. For the PB group, Section 6.1 has contemplated the possibility to rely on one modality. Thus, children in the PB group who chose to rely more on one modality would confront with the same problem that the TO group and PO group were facing. As a result, children would also have problems with information acquisition and question answering even though they received both pictures and text during the intervention.

Moreover, according to the SFL analysis and the MDA (Section 3.3), the use and depiction of verbs are more varied and flexible than the use of participant and circumstance information. In the text, the story involved a variety of verbs, but many of the verbs usually appeared only once. In the pictures, the verbs were presented indirectly and unambiguously through body vectors (a static line created by the body parts), posing problems for children's comprehension. However, in terms of participant information, the main participants in the story were 'the First Slodge', 'The Second Slodge' and 'The Snawk' and occurred in both modalities. The occurrence of these three main participants was much more frequent than that of action verbs. The SFL analysis also showed that the text contains very little circumstance information, thus understanding the circumstance information required less cognitive load and previous knowledge than verbs. With this in mind, it is not hard to understand why participants performed less well in action questions. It is the nature of the information type in the story that made the acquisition of action information more demanding than the other two types of information.

Additionally, only the PB group was found to be significantly better at answering the participant questions than the environmental questions. This means that, for the PB group, participant information was the most accessible type of information. One explanation for this phenomenon is the parallelism (a simple text-picture relationship) of information across the text and picture modality. According to the text-picture

relationship analysis (Section 3.3), the participant and action information were parallel to each other in the two modalities, meaning that the text and pictures conveyed the same information at the same time. However, the circumstance information is hardly parallel to each other in this story: the circumstance in the text may belong to the participant information in the picture and vice versa. Consequently, children might be unable to use one modality to support the other, or to check and confirm their understanding. Let us consider the 'fruit' example mentioned in section 3.3.2.3 (see Figure 15). The fruit belongs to the participant in the text and to the circumstance in the picture. When children wanted to use the picture to understand 'what was shared', they would look for the participant information in the pictures, but they could find the corresponding information of the 'fruit'. Instead, they needed to look at the background information of the picture to find the little red, round thing before realizing that this was the 'fruit' they were looking for.

Figure 15. The Fruit Serving as Circumstance Information in the Picture.

Contrary to Mourão's (2016) argument that calls for using picture books with complex text-picture relationships in an L2 context (see Section 2.2.2), this paper would thus suggest teachers use picture books with simple text-picture relationships with young children. The complex and non-parallel information might also have led to cognitive overload (Rudolph, 2017), as the interview results have shown that it is more difficult to understand the circumstance than the participant information. Based on the previous

example, it is obvious that, if children were referring to both modalities when trying to understand the circumstance information, they would need to spend more attention, more time, and more energy to choose the correct answer on the post-test.

6.3. Vocabulary, Vocabulary Learning and Picture Book Reading

As mentioned in the results chapter, the regression tests have revealed that vocabulary knowledge is a significant predictor of post-test performance, and there is a positive correlation existing between the two variables. In fact, the regression results here supported the previous argument (Section 6.1 and 6.2) that low-level English learners' picture book reading comprehension performances are impacted by their previous English knowledge.

The regression results are partially similar to those of Lepola et al's (2020) study, which also noticed a positive correlation between vocabulary and reading comprehension. However, while vocabulary was positively correlated with reading performance in Lepola et al's (2020) study, their regressions indicated that vocabulary was not a strong predictor of the performance, which opposes to the current regression results that vocabulary knowledge did predict the reading comprehension performance. One explanation could be that Lepola and his colleagues were using wordless picture books, but the current experiment was using a picture book with text as the primary modality. Thus, the PB group and the TO group who received the English text needed to use their vocabulary knowledge. Why vocabulary remained a significant predictor in the PO group that only received pictures? This may be because the post-test that the PO group received contained multiple choice questions in English, requiring children to use their English vocabulary knowledge to find the correct answers and to eliminate those that were incorrect.

Vocabulary is known to be an important factor in reading performance and information

acquisition in picture books (Lepola et al's, 2020). But what about picture books' function in vocabulary learning? After comparing the pre-vocabulary test results and children's inference patterns in the guided think-aloud interviews, the results have shown that picture books can help children infer and understand new words. However, letting children read picture books on their own may not have an obvious effect. Incidental vocabulary learning during the experiment was not as effective as learning with explicit guidance, instructions, and interactions during the interviews. Indeed, it is true that learners can undoubtedly learn new vocabulary from reading, but previous research has also noted relatively low gains (Waring & Nation, 2004). Although the incidental vocabulary learning rate through reading can be as high as 25% (Dupuy & Krashen, 1993), on average, only one-tenth of the words can be learned through merely reading, and concrete words are more easily acquired than abstract words (Day et al., 1991; Waring & Nation, 2004).

Additionally, the effectiveness of incidental vocabulary learning is influenced by factors such as repetition times and the occurrence order of the novel words (Joseph et al., 2014; Uchihara et al., 2019). For example, Saragi, Nation and Meister (1978) found that 93% of the words can be learned when participants had six encounters with the word. Jenkins, Stein and Wysocki (1984) have also noticed that only 25% of their participants had learned a new word after 10 encounters. The variability for the encounter times necessary for the incidental word learning is great in the past studies, ranging from 10 (Webb, 2007), 12 times (Elgort & Warren, 2014) to more than 20 times (Warning & Takaki, 2003). In more recent studies, it was noted that participants were showing a higher level of knowledge of words that occurs early (Joseph et al., 2014). In the light of these results, it is easy to imagine why reading picture books alone is not as effective as guided reading. However, the point to be made here is that remembering a word is not the same as inferring its meaning, and the extent to which a word can be learned through exposure can vary. In the current experiment, the vocabulary learning

discussed here involved recognizing the words and understanding their meanings (receptive knowledge).

Moreover, the finding that reading alone cannot make the full use of picture books is similar to previous studies noting that reading picture books on their own may not convene the full benefits of picture books, either in terms of vocabulary learning (Sun, 2016) or reading comprehension (Gambrell & Jawitz, 1993). During the interview, the interviewer's guidance to refer to both modalities helped children to make full use of modalities and infer the unknown words, but the post-test results indicated that the incidental exposure may not be very effective. Here comes the positive effects of shared book reading. Shared reading has the benefits of cultivating literacy ability, fostering positive attitudes towards reading and drawing children into the joys, and delights (Hoyne & Egan, 2019). Thus, shared book reading is advocated by the current interview results.

Also, the results of the interviews and previous research resonate with the Noticing Hypothesis proposed by Schmidt (1990), who argued that learners need to notice the gap between their output and the input of the target language to generate acquisition. Schmidt's (1990, 2012) Noticing Hypothesis contains three levels: perception (mental representation of the external information), noticing (conscious spotlighting of the instances of language), and understanding (noticing the knowledge gap). During the interviews, the researcher's guidance helped children to notice the gaps, and this is where the learning of the words started. After recognizing the gaps, children attempted to use the input, in this case, the pictures, text and prior knowledge, to infer the meaning of the unknown word. These interview results support Schmidt's (1990) Noticing Hypothesis.

Children used more picture references than text references during the interview. This

could be because pictures are more concrete and less demanding than text references, which normally require morphological and grammatical knowledge. For beginning learners, linguistic knowledge is inadequate, but picture literacy ability is universal and can cross languages. Thus, with appropriate guidance, children may use pictures more than the text to guess or confirm guesses. Apart from the text and pictures, the children would also refer to their prior knowledge, including their previous English knowledge, Chinese knowledge, literature knowledge and world knowledge. This finding is in line with James et al's (2021) study who noted that prior lexical knowledge played an important role in adults' and children's incidental word learning from illustrated stories. The present study therefore reinforces the importance of topic familiarity and prior knowledge, especially when children lack knowledge of the target language. Previous studies have also found that when the reading material is at the teaching level, background knowledge can affect L2 reading comprehension and could be more important than language abilities (Levine & Haus, 1985; Lee, 1986).

6.4. Working Memory and Reading Comprehension

As previous studies have noticed that working memory can influence reading performance (Arrington et al., 2014; Orrantia et al., 2014; Seigneuric et al., 2000), I included working memory as a covariant during the experiment design. However, working memory was not found to have a significant impact on children's post-test performance in this experiment. One possible reason might be that the content of The First Slodge is not complex, as it is prepared for native children aged 3-7, so the story content would not be challenging for them to understand and remember. Also, children in the current experiment were taking immediate post-test after they finish the reading. Thus, the content of the main plot should not be difficult for children to remember, and the content should retain well during the post-test.

6.5. Limitations and Values

As a pioneering work on an experiment based on the results of discourse analysis, there are inevitable limitations to this study and further research is undoubtedly needed in this area. Firstly, it was difficult for the researcher to control how the participants allocated their attention between the two modalities. Although the researcher kept reminding children to look at both modalities, some participants may have still relied primarily on one modality, which would have further affected the post-test results of the PB group. Thus, questions such as whether or not to control children's attention, and how to control the attention need to be addressed in future research.

Secondly, limited by the scale of the research, the current study could only address SFL and MDA's experiential meaning out of three meanings (the other two meanings are interpersonal and textual meaning). The experiential meaning was chosen because it is most relevant to reading comprehension. Yet the SFL suggests that these three meanings (experiential, interpersonal and textual) are inextricably linked. It is thus theoretically inappropriate to separate experiential from the three meanings and to only consider experiential meaning in study design. In fact, the information relevant to the textual meaning was impacting the questions of the post-test. For example, when the post-test asked, 'what happened after…', the 'after' means children need to understand the sequence of actions, which is closely related to the textual meaning of SFL. However, this study chose to focus primarily on the experiential meaning and did not justify the role of textual meaning in the design of the post-test. Consequently, it is suggested that future studies should also take textual meaning into consideration.

Finally, in terms of the experiment and interviews, time constraints did not allow the researcher to conduct one-to-one sessions. During the experiment, participants were subject to the influence of others. For example, if one child completed the whole process, the other two children would speed it up, which could have had an impact on

their performance in the post-test. During the interview, the extroverted children were leading the responses and the introverted children's voices may not have been heard. Considering these limitations, one-to-one sessions may be a better solution if time allows in the future.

However, the originality also adds to the value of this study. The greatest innovation of this study is the introduction of SFL and MDA as the basis for the experiment design and a reference for the interpretation of the results. The analysis helped the researcher fully understand the reading materials, so as to control the experimental design and other details of this study. In other words, this study bridges two separate directions of research on picture books, the semiotic perspective and the educational approach, and draws on the strengths of both of them. Secondly, this is the first study to investigate the relationship between information type and picture book reading, expanding the boundaries of picture book research. Except for the participant, action, and circumstance of SFL's experiential meaning, future research could further investigate whether picture book reading affects the acquisition of 'theme' and 'rheme' (belonging to the textual meaning) and the 'subject', 'finite', 'predictor', 'complement' and 'adjunct' (belonging to interpersonal meaning). It is suggested that future research could consider the three meanings as a whole when designing the experiment. As far as the empirical study itself is concerned, according to the literature review, it fills a gap in the literature of empirical research on picture book reading in the 21st century. Overall, the analytical results, the quantitative experiment and the qualitative interviews helped this study to foster a triangulation, which has made the study more rigorous and valid.

6.6. Implications for Practice

Despite the limitations, this study has shed light on L2 reading comprehension and picture book use. Involving semiotic and analytical theories in experiment design is

valuable from an academic viewpoint. In turn, the findings derived from this research could also help practitioners to better involve picture books in English Language Teaching (ELT), particularly reading instructions, by providing advice to the material choice and activity design. With all of this in mind, the present study also gains practical value.

While previous studies have trumpeted the benefits of picture books and called for involving picture books in the classroom, the current study noted that picture books' benefits might only arise in specific contexts (e.g., shared reading) and so teachers should consider carefully how to implement picture books in their classroom, especially with foreign language learners for whom we have less information. The nature of picture books might be able to arouse children's interest in reading, but it is suggested that language learning by using picture books needs to involve more interactions and guidance. Teachers can use more activities to help children learn new words, better comprehend the content, and gain relevant information. To achieve this, practitioners can turn to some useful resource banks such as the ICEKits (ICEPELL, 2019, https://icepell.eu/index.php/icekits/) where teachers can download the activity materials which are ready for the classroom. If more children are involved in the learning process and activities, they may contribute their previous knowledge to help each other understand the story. Leaving picture books for children to read alone for a very short period of time would be a poor choice for language learning, as this process may not be sufficient to produce learning outcomes. In addition, teachers are advised to make full use of both modes when using picture books. The use of both modes will always be more effective than the use of one of them.

In terms of information type, it is suggested that teachers should focus more on the specific type of information that is more complex (which can vary across picture books). For example, in 'The First Slodge' story, action information is more complex and

demanding than the participant and circumstance information; thus, teachers need to spend more time on teaching the verbs when using 'The First Slodge'. Teachers need to make judgements based on the picture book that they choose for the target group before using the picture book in the classroom. However, not every teacher has been trained to analyze multimodal materials. Thus, relevant multimodal discourse analysis training can be provided to language teachers who would like to involve complex multimodal materials. It is also suggested that the training should start with the experiential meaning analysis techniques (such as who to analyze the verb group—action, the noun group—participant and the adjunct group—circumstance), as the experiential meaning relates to the story content the most.

This experiment has also provided clues on how to select proper picture books in language teaching classrooms. We have known that picture book has various text-picture relationship types. If we refer to Nikolajeva and Scott's (2000 & 2006) relationship continuum mentioned in Section 2.1 and this study's results, symmetrical picture books (with parallel text and picture information) may be more suitable for low-level language teaching classrooms than picture books with other kinds of text-picture relationship. Symmetrical picture books can reduce children's cognitive overload, and children can spend more attention and energy on linguistic information. Teachers are therefore suggested to use picture books with simple and parallel text-picture relationships to teach children the target language. It is also recommended that teachers should choose picture books relevant to children's daily life or choose picture books where children have background knowledge of the story. If children lack the relevant background knowledge, teachers can have an extra session to familiarize children with the background information before introducing the story.

7. Conclusion

This study adds to the literature on L2 reading comprehension in picture books, as it constitutes one of the few empirical studies investigating the relationship between picture books, reading comprehension, information acquisition and vocabulary learning. Previous investigations mainly revealed positive effects of pictures on native speakers' reading comprehension, few have associated picture books with L2 learning environments, let alone information acquisition and L2 vocabulary learning. In an effort to reveal how picture books affect these procedures in the L2 context, this study contained three phases: first, an in-depth analysis of picture books using SFL and MDA, then an experiment designed to examine the performance of the PB, TO and PO groups in terms of reading comprehension and information acquisition, and finally a guided think-aloud interview to examine the effect of picture books on vocabulary acquisition.

The three groups were found to not be significantly different from each other in terms of the post-test performance, suggesting that picture books may not be that helpful in L2 reading. But the value of pictures cannot be denied based on this study, as PB participants performed better in answering the picture-version questions than the text-version questions after reading the text. Of all three information types tested, the action was the hardest one for all groups to acquire and understand. Only the PB group seemed to have easier access to participant information than environmental information. As for vocabulary, there was a strong positive correlation between vocabulary test scores and comprehension test scores, and vocabulary was found to be a significant predictor of reading comprehension. According to the interviews, by referring to the pictures, text and prior knowledge, children could infer the meaning of most unfamiliar words, strengthening the status of the picture book in reading comprehension.

I argued that non-significant results in post-test performance for the three groups can be attributed to the fact that participants lack English language knowledge, overtly rely

on one modality, fail to make connections between the text and the picture, and experience cognitive overload. Although these ideas were hardly investigated in previous literature, the observations of the experiment, the interview, and the analytical results all provided evidence for these possible explanations. It was also noted that for the PB group that received both modalities, participants could better acquire simple and parallel information across two modalities, prompting vital suggestions for future practice. Finally, for inferring the meaning of vocabulary, the results questioned the effectiveness of incidental word learning through reading picture books for a short period and resonated with the Noticing Hypothesis, revealing that noticing the gap between knowledge is the start of language acquisition.

This study is a significant endeavor as it noted that picture books may function better in interactive situations, reminding teachers and parents to design carefully and involve more interactions before and during the use of picture books in the language teaching context. This study also gives teachers and parents advice on how to choose proper picture books as L2 learning materials. From an academic research perspective, this study filled previous gaps and pointed to a new direction in the study of picture books, which is to investigate their use from a systemic functional perspective. All in all, while recognizing the value of picture books in children's language and literacy development, the study's results showed that there is a long way to go in designing and finding unified practical guidelines regarding the use of picture books in the SLA context.

Word Count: 18899

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Appendices:

Appendix A: CUREC Approval Email

Re: MSc Applied Linguistics for Second Language Acquisition/Applied Linguistics for Language Teaching CUREC application for CIA-22HT-010

ⓘ 此邮件的重要性已设置为"低"

将消息翻译为 | 始终不翻译 英语

Katharina Ereky-Stevens

收件人:

抄送: Student CUREC; Faidra Faitaki

周四 2022/3/10 17:02

Dear

The impact of picture books on low-level English learners' reading comprehension: An experiment from a systemic functional perspective.

The above application has been considered on behalf of the Departmental Research Ethics Committee (DREC) in accordance with the procedures laid down by the University for ethical approval of all research involving human participants. I am pleased to inform you that, on the basis of the information provided to DREC, the proposed research has been judged as meeting appropriate ethical standards. Accordingly, approval has been granted.

Please note that any data collection involving in-person interactions with participants must have an up-to-date COVID-19 fieldwork risk assessment in place. Please refer to the current guidance issued by CUREC during the pandemic, notably COVID-19: CUREC guidance on research involving human participants, https://researchsupport.admin.ox.ac.uk/governance/ethics/coronavirus.

If relevant please also check the CUREC website for their best practice research guides, https://researchsupport.admin.ox.ac.uk/governance/ethics/resources/bpg

Good luck with your research study,

Keep well and safe,

All good wishes,

Katharina

Member, DREC

Appendix B: School Invitation Emails (Bilingual)

Dear [Insert Headteacher/EYFS Director's Name],

My name is xxxx and I am a Master Student in the Department of Education at the University of Oxford.

I am interested in investigating whether picture books can help young English learners' reading comprehension. I aim to figure out what type of information children might gain from pictures and what type of information children gain from the text. To do this, I need to recruit 120 5th grade (age 10-11) Chinese English learners to participate in my research. Thus, I came across your school.

I also attached a document with detailed information about what is the procedure of the project, what children will do in the experiment, and what will the school gain from involving. If you have any questions or concerns about this research, please do not hesitate to contact me.

I would be really appreciated it if I have a primary school like yours on board. I am looking forward to hearing from you! Thank you in advance for your cooperation.

Best wishes,
xxxxxxx

Lady Margaret Hall, Norham Gardens, Oxford, Oxfordshire OX2 6QA
Direct Line: (+44) (0)xxxxxxxxxx (UK), (+86) xxxxxxxxxx (China)
E-Mail: xxxxxxxx@education.ox.ac.uk

亲爱的[插入校长/EYFS 主任的姓名]。

我叫 xxxx，是牛津大学教育系的一名硕士生。

我对调查绘本是否能帮助年轻英语学习者的阅读理解非常感兴趣。我的目标是弄清楚儿童可能从图片中获得什么类型的信息，以及儿童从文本中获得什么类型的信息。为此，我需要招募 120 名五年级（10-11 岁）的中国英语学习者来参与我的研究。因此，我希望能从贵校收集此次实验数据。

我还附上了一份文件，详细介绍了这个项目的程序是什么，孩子们在实验中会做什么，以及学校会从参与中获得什么。如果你对这项研究有任何疑问或关切，请不要犹豫，与我联系。

如果贵校能加入这个实验，我将非常感激。我期待着您的来信！提前感谢您的合作。

顺颂时祺，

xxxxxxx

Lady Margaret Hall, Norham Gardens, Oxford, Oxfordshire OX2 6QA

联系电话：(+44) (0)xxxxxxxxxx（英），(+86) xxxxxxxxxx（中）。

电子邮件：xxxxxxxx@education.ox.ac.uk

Appendix C: Information Sheet for Parents (Bilingual)

UNIVERSITY OF OXFORD

DEPARTMENT OF EDUCATION

15 Norham Gardens, Oxford, OX2 6PY
Tel: (+44)(0)1865274024 Fax: (+44)(0)1865274027
general.enquiries@education.ox.ac.uk, www.education.ox.ac.uk
xxxx, MSc Student
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Direct Line: (+44)(0)xxxxxxxxxx (UK), (+86) xxxxxxxxxx (China)
E-Mail: xxxxxxxx@education.ox.ac.uk

[The impact of picture books on low-level English learners' reading comprehension]

INFORMATION SHEET FOR PARENTS / GUARDIANS

Ethics Approval Reference: [CIA-22HT-010]

In partnership with researchers at the University of Oxford, your child's school has agreed to take part in a study investigating [whether the use of picture books can impact low-level English learners' reading comprehension]. We would like to invite your child to be part of this study. We very much hope you would like your child to take part, but before you decide, it is important that you understand why the study is being done and what it will involve.

What are we trying to find out?

This project is looking at how low-level English learners read English picture books. We already know that pictures can help children gain a better comprehension of a text. We are especially interested in seeing how this might happen from a systemic functional perspective. Very few studies have looked at the type of information children gain from different modalities (picture/text) of a picture book. This project will allow us to see which type of information children can better gain from pictures and which from the text. This can really help parents and teachers teach young children how to read in the future; thus, we would really appreciate you and your children's participation.

More information about the project can be obtained by contacting the research team (contact at xxxxxxxx@education.ox.ak.uk, or on +86 xxxxxxxxxx; +44 xxxxxxxxxx) [delete as appropriate].

Why has my child been invited to take part?

We are inviting your child to take part because they are a young person, aged between 10 and 11 years, attending [Jingsong Primary School].

We are inviting 120 young people to take part.

Does my child have to take part?

No. You can ask questions about the study before deciding whether or not to allow your child to participate. If you do agree to participate, you may withdraw your child and their data from the study at any time, without giving a reason and without penalty, by advising the researchers of this decision.

What will happen if my child takes part?

- Your child will be asked to participate in a vocabulary test and working memory test, which will take around 10 minutes. Your child will look at some pictures and complete a memory task on the researcher's computer.
- Then, your child will have a chance to read a very interesting story in English. The story may be presented in a picture-only format, in a text-only format or a picture + text format. Your child can read the story at their own pace, but this story is short so reading will not take long!
- After finishing the reading, your child will need to answer some comprehension questions. This test does not have many questions; thus, he/she can finish it within 15 minutes.
- Very few children (less than 10) may also participate in a short interview asking what they were thinking when they answer the comprehension questions. This interview will be video-recorded and takes around 15 minutes. In the video recording, we will only video-record your child's hands and the picture book; thus, all activities will be anonymised.
- Alongside the consent form, there will also be a mini questionnaire for parents, which will ask you to answer some general questions about your age and their reading time.
- All these activities will happen in children's spare time in school. Your child will not miss any classes and school activities.
- All these activities will happen in your child's usual classrooms.

What are the advantages / disadvantages of taking part?

Regular summaries of our findings will be given to the school and will be available to interested families. The study results can give teachers and parents advice on how to use

picture books in the future. The researcher may also provide a general result of participants' reading level to the school if the school asks for it.

What happens to the data provided? [1]

The information you or your child provide during the study is the **research data**. Any research data from which you or your child can be identified, is known as **personal data**. However, all the research data will be anonymised in this research project; thus, no personal data will be involved.

Personal / sensitive data will be stored in the researcher's password-protected computer. The data will be stored for at least 3 years after publication. The data will be deleted after confirming that there is no future needed.
Consent forms will be retained by the researchers for 3 years after the publication of the work of research.

Other research data will be stored for 3 years after publication or public release of the work of the research.

The researcher (xxxx), supervisor (Faidra Faitaki) will have access to the research data. Responsible members of the University of Oxford may be given access to data for monitoring and/or audit of the research.

I would like your permission to use de-identified data in future studies, and to share data with other researchers (e.g. in online databases).

Will the research be published?

The research may be published in academic journals and presented in conferences.

The University of Oxford is committed to the dissemination of its research for the benefit of society and the economy and, in support of this commitment, has established an online archive of research materials. This archive includes digital copies of student theses successfully submitted as part of a University of Oxford postgraduate degree programme. Holding the archive online gives easy access for researchers to the full text of freely available theses, thereby increasing the likely impact and use of that research.

The research will be written up as the researcher's thesis.

[1] Please refer to CUREC's Best Practice Guidance on Data Collection and Management (BPG 09)

On successful submission of the thesis, it may be deposited both in print and online in the University archives to facilitate its use in future research. If so, the thesis will be openly accessible.

What will happen to any samples taken from my child?

Your child's sample will be very likely to be only used for this research. If there are any meta-analyses or investigations conducted in the future, the anonymised data might be used for another research as well.

Who is conducting this research?

The research project is organised by xxxx of Oxford University, who is a Masters student. The researcher has completed her DBS check to be able to go into the school. This study has been reviewed by, and received ethics clearance through, the University of Oxford's Central University Research Ethics Committee, [CIA-22HT-010].

What if there is a problem?

I If you have a concern about any aspect of this study, please contact Xxxxx at <xxxxxxxx@education.ox.ak.uk >, or on <+86 xxxxxxxxxx; +44 xxxxxxxxxx>, and we will do our best to answer your query. I/we will acknowledge your concern within 10 working days and give you an indication of how it will be dealt with. If you remain unhappy or wish to make a formal complaint, please contact the Chair of the Research Ethics Committee at the University of Oxford who will seek to resolve the matter as soon as possible:

Chair, **Social Sciences & Humanities Inter-Divisional Research Ethics Committee**; Email: ethics@socsci.ox.ac.uk; Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD

Data Protection

The University of Oxford is the data controller with respect to your child's personal data and, as such, will determine how your child's personal data is used in the study.

The University will process your child's personal data for the purpose of the research outlined above. Research is a task that we perform in the public interest.

Further information about your rights with respect to your child's personal data is available from https://compliance.web.ox.ac.uk/individual-rights.

What should I do next?

Please fill in the enclosed form and return it to your child's class teacher if you would like your child to take part in this study. Please remember that you may withdraw your child at any time, without penalty and without giving a reason, by notifying the researcher.

If you would like to discuss the research with someone beforehand (or if you have questions afterwards), please contact:

xxxx
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15 Norham Gardens, Oxford, OX2 6PY
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[绘本对低水平英语学习者的阅读理解的影响]

给家长/监护人的信息告知书
实验道德伦理批准编号 [CIA-22HT-010]

各位家长，大家好！您孩子的学校已经同意参加一项与牛津大学研究人员合作的研究，此研究的目的是为了调查[使用图画书是否会影响低水平英语学习者的阅读理解]。我们希望邀请您的孩子参与这项研究，但在您决定之前，我们需要告知您为什么要进行这项研究，以及这项研究将涉及什么。

我们试图研究什么？
这个项目正在研究低水平英语学习者如何阅读英语绘本。先前的研究已经告诉我们，图片可以帮助儿童更好地理解文本。而在此项研究中，我们特别感兴趣的是，如何从从系统性功能语法的角度来理解这一现象。在过去，很少有研究关注儿童能从绘本不同的信息模态（例如，图片/文字）中获得什么样的信息，而这个项目将使我们能够看到哪种类型的信息儿童可以更好地从图片中获得，哪种类型的信息可以更好的从文本中获得。这可以帮助家长和老师在未来教孩子们如何阅读。因此，我们非常感谢您和您的孩子的参与。
有关该项目的更多信息，请联系研究小组（xxxx 邮箱：xxxxxxxx@education.ox.ak.uk，或致电+86 xxxxxxxxxx）。

为什么我的孩子被邀请参加？
我们邀请您的孩子参加，因为他们年龄介于 10 到 11 岁之间，在[劲松小学]就读五年级。我们总共会邀请约 120 名参与者。

我的孩子必须参加吗？
不是，您可以先询问有关研究的问题，再决定是否让您的孩子参加。如果您同意参加，您有权在实验的任何阶段中止参与或将您的孩子的数据从研究中撤出，您不需要给出任

何理由，只要将这个决定告知研究人员即可。

如果我的孩子参加了，会发生什么?

- 您的孩子首先会参与一个词汇测试和工作记忆测试，大约需要 10 分钟。您的孩子将在研究人员的电脑上看一些图片并完成一些记忆任务。
- 然后，您的孩子将有机会用英语阅读一个非常有趣的故事。这个故事可能以纯图片的形式、纯文字的形式或图片+文字的形式呈现。您的孩子可以按照自己的节奏阅读故事，但这个故事很短，所以阅读不会花很长时间!
- 完成阅读后，您的孩子需要回答一些阅读理解问题。这个测试的问题不多，因此，他/她可以在 15 分钟内完成测试。
- 极少数孩子（10 人左右）还可能参加一个简短的访谈，询问他们在回答理解问题时的想法。这个访谈将被录像，大约需要 15 分钟。在录像中，我们将只对您孩子的手和图画书进行录像，不会对您孩子的面部录像。这些活动以及数据都将被匿名记录。
- 除了同意书外，还将有一份给家长的小型问卷，您需要回答一些关于您孩子的年龄和他们的阅读时间的一些普遍性问题。
- 所有这些活动将在孩子们在学校的业余时间进行。您的孩子将不会错过任何学校课程和学校活动。
- 所有这些活动都将在您孩子平时的教室里进行。

参加此项研究有什么好处/坏处?

我们将定期向学校提供研究结果的阶段性总结，并向感兴趣的家庭提供。研究结果可以给教师和家长提供关于未来如何使用图画书的建议。如果学校提出要求，研究者也可以向学校提供参与者的阅读水平的大致结果。但由于数据和隐私保护的原因，我们将无法给出某个孩子的特定数据，当我们可以提供他/她的大致水平。

我孩子的数据会怎样?

您或您的孩子在研究中提供的信息就是研究数据。任何可以识别您或您的孩子的研究数据，都被称为个人数据。然而，在这个研究项目中，所有的研究数据将被匿名化；因此，不会涉及到个人数据的识别或泄漏。

个人/敏感数据将被储存在研究人员的密码保护的电脑中。这些数据将在发表后至少保存 3 年。在确认未来没有需要后，数据将被删除。

同意书将由研究人员在研究工作发表后保留 3 年。

其他研究数据将在研究工作出版或公开发布后保存 3 年。

研究员（xxxx）、导师（Faidra Faitaki）将有机会接触研究数据。牛津大学的负责成员可能会被允许访问数据，以便对研究进行监督和/或审计。

我希望您允许我在未来的研究中使用去掉身份识别的数据，并与其他研究人员分享数据（如在在线数据库中）。

研究会被发表吗？
该研究可能会在学术期刊上发表，并在学术会议上展示。

牛津大学致力于传播其研究，以造福于社会和经济。为了支持这一承诺，牛津大学已经建立了一个在线研究材料档案。该档案包括作为牛津大学研究生学位课程的一部分学生论文的数字副本。此档案使研究人员可以很容易地获得免费提供的论文全文，从而提高该研究的可能影响和使用。

该研究将被写成研究者的硕士毕业论文。在成功提交后，此论文会以印刷品和在线方式存放在大学档案馆，以方便在未来的研究中使用。如果是这样，论文将被公开访问。

从我的孩子身上提取的任何样本将如何处理？
你孩子的样本将很可能只用于这项研究。如果将来有任何荟萃分析或调查，匿名的数据也可能被用于另一项研究。

谁在进行这项研究？
该研究项目由牛津大学的 xxxx 组织，她是一名硕士生。研究员已经完成了她的 DBS（无犯罪记录）检查，以便能够进入学校。这项研究已经过牛津大学中央大学研究伦理委员会的审查，并获得道德伦理许可，[CIA-22HT-010]。

如果有问题怎么办？
如果您对本研究的任何方面有疑虑，请联系 xxxx：<xxxxxxxx@education.ox.ak.uk>，或致电<+86 xxxxxxxxxx>，我们会尽力回答您的疑问。 我将在 10 个工作日内确认你的关切，并向你说明如何处理。 如果你仍然不满意或希望进行正式投诉，请联系牛津大学研究伦理委员会主席，他将尽快解决这一问题。

社会科学与人文科学部门间研究伦理委员会主席：电子邮件：ethics@socsci.ox.ac.uk；地址：牛津大学研究服务部，Wellington Square, Oxford OX1 2JD。

数据保护
牛津大学拥有您孩子个人数据的数据所有权，因此，将决定您孩子的个人数据如何在研究中使用。

大学将为上述研究的目的处理您孩子的个人数据。研究是我们为了公共利益而进行的一项任务。

关于你对你孩子的个人数据的权利的进一步信息，可从以下网站获取：https://compliance.web.ox.ac.uk/individual-rights。

我接下来应该做什么？
如果您想让您的孩子参加这项研究，请填写随附的表格，并将其交给您孩子的班主任。

请记住，你可以在任何时候通知研究人员，中止实验，回收数据不需要给出理由。
如果你想事先与人讨论研究（或事后有疑问），请联系：

xxxx
牛津大学教育系
15 Norham Gardens, Oxford, OX2 6PY
电话：(+44)(0)1865274024 传真：(+44)(0)1865274027
电子邮件：general.enquiries@education.ox.ac.uk, www.education.ox.ac.uk

Appendix D: Information Sheet for Children (Bilingual)

UNIVERSITY OF OXFORD

DEPARTMENT OF EDUCATION

15 Norham Gardens, Oxford, OX2 6PY
Tel: (+44)(0)1865274024 Fax: (+44)(0)1865274027
general.enquiries@education.ox.ac.uk, www.education.ox.ac.uk
xxxx, MSc Student
Lady Margaret Hall, Norham Gardens, Oxford, Oxfordshire OX2 6QA
Direct Line: (+44)(0)xxxxxxxxxx (UK), (+86) xxxxxxxxxx (China)
E-Mail: xxxxxxxx@education.ox.ac.uk

The impact of picture books on low-level English learners' reading comprehension

INFORMATION SHEET FOR CHILDREN AGED 6 TO 10 YEARS

To be shown and read by parent/guardian if required

Ethics Approval Reference: [CIA-22HT-010]

My name is xxxx and I study at the University of Oxford. I am doing some research and would like you to join in.

Research is a way we try to find out the answers to questions. We want to see whether the use of picture books can impact English beginners' reading comprehension, and what is the difference in getting information from texts and pictures. The research questions are:

1. Whether picture can assist English beginners' reading comprehension? If so, how picture book assists children's understanding of a story?
2. Whether the type of information children obtain from texts and pictures varies? If so, what kind of information can be better gained through the text? What kind of information can be better obtained through the picture?

You can talk to your family, friends, or the researchers if you want to before you agree to join in.

Why have I been asked?

We are asking you if you would like to take part because you are between 10 and 11 years old, 5th Grade Primary school students.

We are asking 120 children to help us.

Your parent/guardian has said it is OK for you to join in.

Do I have to join in?

No you don't have to if you don't want to! You can ask questions before choosing whether you want to join in.

You can change your mind at any time by telling the researcher or your parent/guardian. You don't have to say why.

If you decide to stop, no one will be upset with you.

What will happen?

- You will be asked to participate in a vocabulary game and memory game, which will take around 15 minutes. You will look at some pictures and play a memory game on the researcher's computer.
- Then, you will have a chance to read a very interesting story in English. The story may be presented in a picture-only or text-only or a picture book with both text and pictures. You can read the story at your own pace, but this story is short so it would not take long!
- After finishing the reading, you need to answer some questions about what you read. You will have answered all the questions within 15 minutes.
- Very few of you (less than 10 people) may also participate in a short interview asking what you were thinking when you answer the comprehension questions. This interview will be video recorded and takes around 15 minutes.
- All these activities will happen in your spare time in school. You will not miss class and school activities.
- All these activities will happen in your usual classrooms.

Will anything about the research upset me?

Every activity in this experiment has been designed to be interesting. However, if

there do come times when you feel uncomfortable, please tell the researcher or your teacher. You can stop participating in the research at any time you want. We are all very supportive and understand every decision and concern. Your enjoyment is the most important thing for this research.

Will joining in help me?

The study will not help you, but it might help other children in the future.

Will anyone else know I'm doing this?

The people in our research team will know you are taking part. No one else will know that you have helped us with this research - unless, of course, you tell them yourself!

What happens to what the researchers find out?

When we collect information from you, we keep it in a safe place and only the people doing the research, or helping with the research, can look at it. we'll talk about the project with our colleagues and write about it for them to read.

Is this study OK to do?

Before any research involving people happens it has to be checked by a group of people known as a Research Ethics Committee to make sure that it is fair. This study has been checked by the Ethics Committee at the University of Oxford.

What if there is a problem or something goes wrong?

If you are not happy because of something that happened in the study, please talk to your parent/guardian who will let the researcher know.

Thank you for reading – please ask us any questions.

牛津大学

教育系

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xxx，硕士研究生
地址：Lady Margaret Hall, Norham Gardens, Oxford, Oxfordshire OX2 6QA
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邮箱: xxxxxxxx@education.ox.ac.uk

[绘本对低水平英语学习者的阅读理解的影响]

6 至 10 岁儿童信息告知书
如有需要，由家长/监护人出示并阅读

实验道德伦理批准编号 [CIA-22HT-010]

我叫 xxx，是一名牛津大学的硕士研究生。我正在进行一些研究，需要你的参与。

研究是我们试图找出问题答案的一种方式。我们想看看使用绘本是否会影响英语初学者的阅读理解，以及从文本和图片中获取信息的区别是什么。研究的问题是：
1. 图片是否能帮助英语初学者的阅读理解？如果是的话，图画书是如何帮助儿童理解故事的？
2. 儿童从文本和图片中获得的信息类型是否不同？如果是的话，什么样的信息可以通过文本更好地获得？什么样的信息可以通过图片更好地获得？

在你同意加入之前，如果你愿意，你可以和你的家人、朋友或研究人员谈谈。

为什么问我是否参加？
我们问你是否愿意参加，是因为你的年龄在 10 到 11 岁之间，是小学五年级的学生。
我们需要 120 名儿童来帮助我们。
你的父母/监护人说可以让你参加。

我必须参加吗？
不，如果你不愿意，你不一定要这样做！你可以在选择是否要加入之前先问一些你的问题。
你可以在任何时候改变主意，告诉研究人员或你的父母/监护人。你不需要说原因。如果你决定停止，没有人会对你不满。

将会发生什么?

- 你会参与一个词汇测试和记忆游戏，这大约需要 15 分钟。你将在研究人员的电脑上看一些图片并玩一个记忆游戏。
- 然后，你将有机会用英语阅读一个非常有趣的故事。这个故事可能以纯图片或纯文字的形式呈现，也可能是一本既有文字又有图片的绘本。你可以按照自己的节奏来读这个故事，但这个故事很短，所以不会花很长时间!
- 完成阅读后，你需要回答一些关于阅读内容的问题。问题不多，你一定能在 15 分钟内回答所有的问题。
- 你们中的极少数人（10 人左右）也会参加一个简短的采访，询问你们在回答理解问题时的想法。这个采访将被录像，大约需要 15 分钟。
- 所有这些活动都将在你在学校的业余时间进行。你将不会错过课堂和学校活动。
- 所有这些活动都将在你们平时的教室里进行。

关于研究的事情都会使我不安吗?

本实验中的每项活动都被设计得很有趣。但是，如果确实有你感到不舒服的时候，请告诉研究人员或你的老师。你可以在任何时候停止参与研究。我们都非常支持并理解每一个决定和担忧。对于这项研究，你的乐趣是最重要的。

加入进来对我有帮助吗?

这项研究不会帮助你，但它可能在未来帮助其他儿童。

会有其他人知道我在做这个吗?

我们研究小组的成员会知道你在参与。没有其他人会知道你帮助我们进行这项研究--当然，除非你自己告诉他们。

研究人员发现的东西会怎样?

当我们从你那里收集信息时，我们会把它保存在一个安全的地方，只有做研究的人或帮助研究的人可以看它。我们会和我们的同事谈论这个项目，并写下它供他们阅读。

这项研究可以做吗?

在任何涉及人的研究发生之前，必须由一组被称为研究伦理委员会的人检查，以确保它是公平的，道德的。这项研究已经被牛津大学的伦理委员会检查过。

如果出现问题或出错怎么办?

如果你因为研究中发生的事情而不高兴，请与你的父母/监护人交谈，他们会让研究人员知道。

谢谢你的阅读--请向我们提出任何问题!

Appendix E: Consent Form for Parents (Chinese version)

牛津大学

教育系

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邮箱：general.enquiries@education.ox.ac.uk, www.education.ox.ac.uk
xxx，硕士研究生
地址：Lady Margaret Hall, Norham Gardens, Oxford, Oxfordshire OX2 6QA
联系电话: (+44)(0)xxxxxxxxxx(英), (+86) xxxxxxxxxxx (中)
邮箱: xxxxxxxx@education.ox.ac.uk

[绘本对低水平英语学习者的阅读理解的影响]

家长/监护人同意书

道德伦理审查（CUREC）编号： CIA-22HT-010

- 您孩子的学校已经同意参加牛津大学的一项研究，研究使用图画书是否会影响低水平英语学习者的阅读理解，以及在两种模式（文字和图片）中获得不同类型的信息有什么区别。
- 如果您的孩子参加，研究人员会来学校收集数据，做一些活动，和他们玩一些有趣的游戏。
- 如果您愿意让您的孩子参加，请填写下面的表格，并尽快交予您孩子的班主任。
- 要了解更多关于这项研究的信息，请阅读附件中的信息表。如果您有任何问题，也可以发电子邮件到<xxxxxxxx@education.ox.ak.uk>，或致电<+86 xxxxxxxxxx; +44 xxxxxxxxxx>。

- -

儿童班级： ____________   **儿童姓名：** ____________________

学校名称： ____________

我已经阅读并理解了上述研究的细节，并有能与他人，包括孩子讨论是否参与该研究。如果我有问题或顾虑，我已经和相关人士讨论过我的顾虑，并且已经得到了满意的答复。我明白该项目已通过牛津大学涉及人类参与者的研究伦理审批程序获得了伦理许可，我也明白谁将有机会接触到数据，数据将如何储存，以及在研究结束后数据将如何处理。我明白参与是自愿的，我和我的孩子可以在任何时候自由退出，不需要给出任何理由，我孩子的教育也不会受到任何影响。我了解如何提出关切或投诉。

我同意对我的孩子进行录像	是	☐	否	☐
我了解在研究成果中如何使用录音/录像/照片	是	☐	否	☐

我同意我的孩子参加上述研究。

家长姓名：____

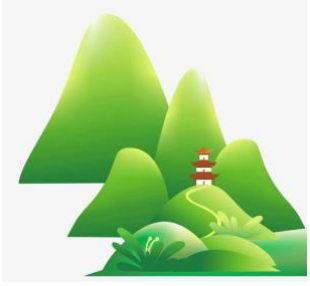
签名:____________________________________   日期：__________

研究者姓名：____

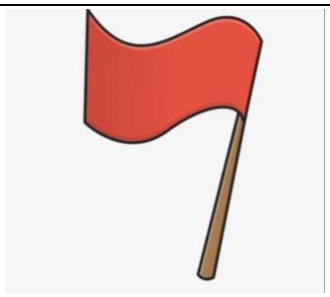
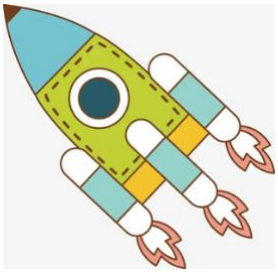
研究者签名：__________________________________   日期：__________

Appendix F: Pre-task Vocabulary Test

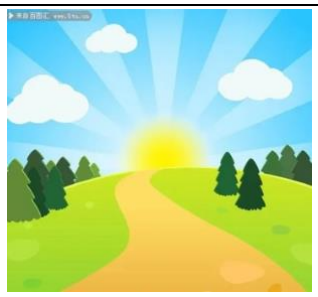
Group 1: Learned Vocabularies from Textbooks

 football	 book
 sandwich	 onion
 dance	 swim
 bike	 flower
 clock	 mountain

Group 2: Unknown Words from 1st Year middle School Textbook

 violin	 uniform
 flag	 newspaper
 skate	 snake
 rocket	 honey
 ticket	 corn

Group 3: Words from The First Slodge

 universe	 sunrise
 shock	 lightning
 scare	 bite
 fight	 jump
 furious	 splash

Appendix G: Comprehension Post-test [Two Versions (Picture-version Questions and Text-version Questions) in One]

Questions in Blue: Text Version test sheet
Questions in Black: Picture Version test sheet

Answers in Green: irrelevant answer
Answers in Red: Correct answer
Answers in Orange: relevant but incorrect answers

Action-only Question (Question about the verb)

AQ1:

What does the First Slodge do with the flower?
The First Slodge 对小花做了什么?

A: pick
B: smell
C: look at
D: work

What does the First Slodge do with this picture?
第一个 Slodge 对图上的东西做了什么?

A: pick
B: smell
C: look at
D: work

AQ2:

What does the first Slodge do when she is sleeping?
第一个 Slodge 在睡着的时候做了什么?

A: run
B: sleepwalk
C: dream
D: bite the fruit

What else does the First Slodge do in this picture?
在这时，第一个 Slodge 还做了什么?

A: run
B: sleepwalk
C: dream
D: bite the fruit

AQ3:

In this story, the first Slodge and the second Slodge disagree about who the fruit belongs to. What happens after this?

在这个故事里, The First Slodge 和 The Second Slodge 抢夺了水果。在这之后发生了什么?

A: they fight

B: they argue

C: they play

D: they exercise

What happens after this picture?

在这张图之后发生了什么?

A: they fight

B: they argue

C: they play

D: they exercise

AQ4:

What does the Second Slodge do to the Snawk?

第二个 Slodge 对 Snawk 做了什么?

A: drink

B: pull

C: bite

D: scare away

Pic 1 图 1

Pic 2 图 2

What does picture 1 do to picture 2?

图 1 对图 2 做了什么?

A: drink

B: pull

C: bite

D: scare away

AQ5:

What do the two Slodges do to the fruit after the Second Slodge saved the First?

第二个 Slodge 救了第一个 Slodge 之后，他们对水果做了什么?

A: share

B: wash

C: bite

D: sleep

Pic 1 图 1

Pic 2 图 2

After picture 1, what do they do to the picture 2?

图 1 之后，他们对图 2 做了什么?

A: share

B: wash

C: bite

D: sleep

Circumstance-related Question

CQ1: participants in Text, circumstance in picture

What does the first slodge see for the first time at night?
Slodge 在晚上第一次看到了什么?

A: star and moon
B: pen
C: plane
D: cloud

What does the first Slodge see in this picture for the first time?
第一个 Slodge 在这张图里第一次看到了什么?
A: star and moon
B: pen
C: plane
D: cloud

CQ2: participant in text, circumstance in picture

What do the First Slodge and the Second Slodge share?
the First Slodge 和 the Second Slodge 分享了什么?
A: Snawk
B: fruit
C: pen
D: baby

What do they share in this picture?
图片上他们分享了什么?
A: Snawk
B: fruit
C: pen
D: baby

CQ3: circum in text + circum in picture

The Second Slodge jumps in the sea with what?

The Second Slodge 伴随着什么跳进海里?

A: with a sound

B: with a splash

C: with a smile

D: with a ball

图 1: The Second Slodg

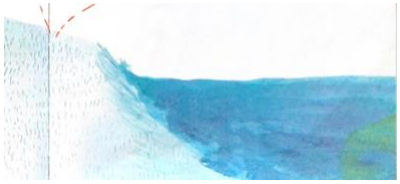


图 2 海洋; sea

Picture 1 jumps into picture 2 with what?

图 1 的人伴随着什么跳进图 2 里?

A: with a sound

B: with a splash

C: with a smile

D: with a ball

CQ4: circum in text, participant in picture

Who feels shocked when the First and the Second Slodge meet for the first time?

当 the First Slodge 和 the Second Slodge 第一次见面的时候，谁感到震惊?

A: the First Slodge

B: both of them

C: the Second Slodge

D: happiness

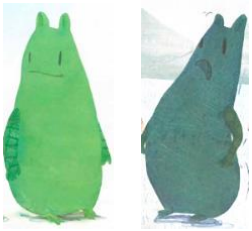


图 1 the First Slodge 图 2 the Second Slodge

Who feels shocked when picture 1 and 2 meet for the first time?

图 1 和图 2 第一次见面的时候，谁感到震惊?

A: the First Slodge

B: both of them

C: the Second Slodge

D: happiness

CQ5: environment in picture, action in text

After the fruit rolled down the hill, what happens to the fruit?

水果在滚下山之后怎么了？

A: eat

B: hit someone

C: fall into the sea

D: skip on the ground

What happens to the fruit after this picture?

这张图片上的水果之后发生了什么？

A: eat

B: hit someone

C: fall into the sea

D: skip on the ground

Participant-only question

PQ1:

Who takes the first bite of the fruit?
谁咬了第一口水果?

A: The First Slodge
B: The Second Slodge
C: The Snawk
D: Sister

Who bites the thing in this picture?
谁咬了图片上的东西?

A: The First Slodge
B: The Second Slodge
C: The Snawk
D: Sister

PQ2:

Who takes the second bite of the fruit?
谁咬了第二口水果?

A: The First Slodge
B: The Second Slodge
C: The Snawk
D: Sister

Who bites the thing in this picture again?
谁又咬了图片上的东西?

A: The First Slodge
B: The Second Slodge
C: The Snawk
D: Sister

PQ3:

Who is scared away in this story?

这个故事里，谁被吓跑了？

A: The first Slodge

B: The Second Slodge

C: me

D: The Snawk

图 1 Snawk

图 2 the First Slodge

图 3 the Second Slodge

See picture 1,2,3, who is scared away in this story?

图 1，2，3 中。在这个故事里，谁被吓跑了？

A: The first Slodge

B: The Second Slodge

C: me

D: The Snawk

PQ4:

Who saves who in this story?

这个故事里，谁救了谁？

A: The Slodge saves me

B: The Second Slodge saves the First Slodge

C: The First Snawk saves the First Slodge

D: The Second Slodge saves The First Snawk

图 1 Snawk

图 2 the First Slodge

图 3 the Second Slodge

See picture 1,2,3, who saves who in this story?

图 1，2，3 中。在这个故事里，谁救了谁？

A: The Slodge saves me

B: The Second Slodge saves the First Slodge

C: The First Snawk saves the First Slodge

D: The Second Slodge saves The First Snawk

PQ5:

According to this story, the world belongs to who?

根据这个故事，这个世界是属于谁的?

A: Slodge

B: Snawk

C: Everyone

D: me

Accodring to this picture, the world belongs to who?

根据上图，这个世界属于谁?

A: Slodge

B: Snawk

C: Everyone

D: me

Appendix H: Annotated Unfamiliar Words and Unfamiliar Words Remain Unchanged

Annotated Words:

first	第一个
pick	采摘
dream	做梦
second	第二个
another	另一个
terrible	糟糕的；差劲的
think	想，认为，觉得
roll down	滚下
hill	山坡
supper	晚饭
save	拯救
share	分享
friendship	友谊
belong to	属于

11 unchanged words: (also are the words that children made inferenced during the Think-aloud interviews)

'universe', 'Sunset/Sunrise', 'Bite', 'Lightning', 'Thunder', 'Shock', 'Fight', 'Splash', 'Scare away', 'Furious'.

Appendix I: Analyzing the experiential metafunction (meaning) of a text

When looking at how language works for experiential meaning, the analysis focuses more on the propositional content of a message than the purpose of the message (Thompson, 2013). As writers and speakers have many ways to convey their message, the actual choice is thus worth analyzing. The three analyses that experiential meaning focuses on are: *participants* (who and what), *processes* (did) and *circumstance* (in what environment). The grammatical representations of *participants* (for example, in sentence 'Mary is playing piano', Mary and piano are the participants) are the noun phrases that serve as the action initiators and receivers. The verb phrases are the main actions (*processes*) of each clause. Finally, the prepositional phrases and environmental adjuncts, which encode information about the background in which the process takes place (e.g. the place, time, manner), are the compositions of *circumstance*.

The analysis of the verb is called *transitivity analysis.* The analysis of verb in each sentence are usually treated as the foundation of SFL analysis, from which the complete analysis is derived (Fontaine, 2012). According to Figure a, Halliday (Halliday & Matthiessen, 2013) categorized the verb in each analysis clause into six types: material ('doing' verbs, such as jumping, walking, dancing), verbal ('saying' verbs, such as shouting, saying), mental (verbs for mental processes, such as thinking, imaging, liking, seeing, hearing, wanting), relational (verbs establishing the relationship between two concepts, such as being), existential ('there is…' sentences) and behavioral (human physiological verbs, such as sneezing, eating, coughing). After judging the transitivity types of each clause, analysts can further calculate the percentage of each type and take a glimpse at what the story/the text is about. Whether a text is about a series of actions, a depiction of the mental world or trying to establish the relationship between two things.

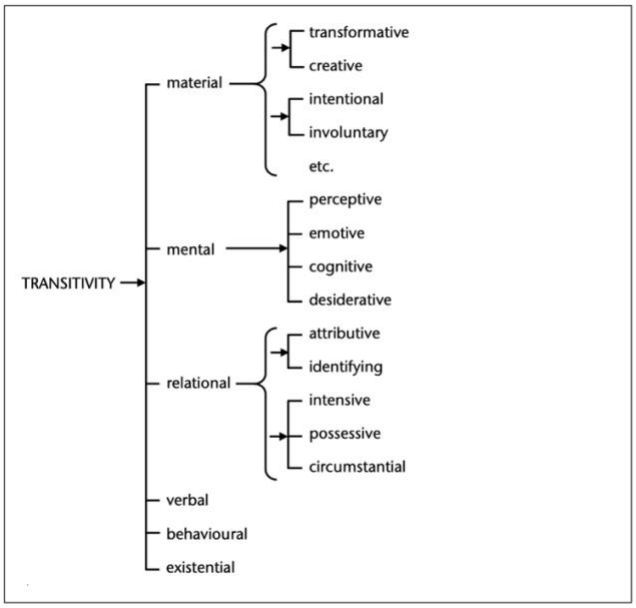


Figure a: The System of Transitivity Choice (Thompson, 2013: 114)

Appendix J: Analyzing the ideational metafunction (meaning) of a picture

Considering that texts and pictures are completely different forms, the analytical focus and techniques differ from each other, although the components of ideational (experiential) meaning are still the participants, the process, and the context. This section will present the types of information that Painter, Martin and Unsworth's (2013) SF-MDA model focuses on when analysing the ideational meaning of a picture book.

In Painter et al's (2013) SF-MDA model, there are two main focuses when analysing the participants of a picture, as Figure b shows: the *character manifestation* (how characters are depicted) and the *character appearance* (whether the character appears for the first time or reappears). *Complete* manifestation means the picture has both character's head and body parts, while a *Metonymic* character will only have body parts or a shadow on the canvas. In terms of appearance, if the character reappears in the story, the character reappearance can be divided into unchanged/varied reappearance, and immediate/later reappearance. The variation can be either in status (whether the character takes a larger proportion of the picture) or attribution (whether the character got a more detailed depiction or accessory).

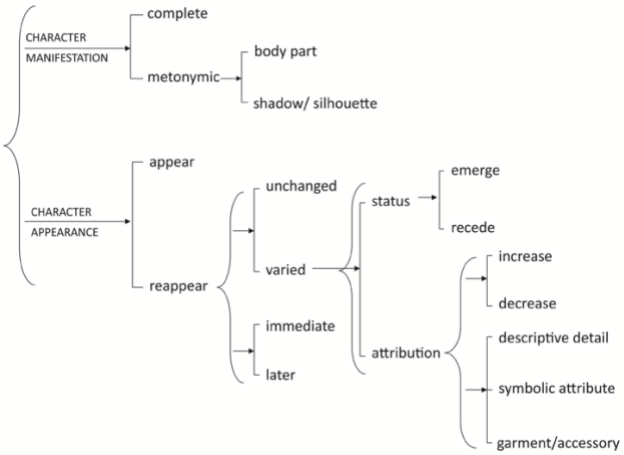


Figure b: Character Manifestation and Appear options (Painter et. al., 2013, p.64)

The process types of Painter et al's (2013) model are less diverse than Halliday's model (Halliday & Matthiessen, 2013). Their model only has three main types: action (transitive/intransitive), verbal, and mental (cognition/ perception). An [action: intransitive] only contains single participants and has vectors with limbs, for example, a running person. An [action: transitive] usually contains pictorial elements, and has vectors connecting the two elements, for example, a person watering a flower. A verbal action is realized by a vector with a speech bubble. A [mental: cognition] can be realized by using thought bubbles. A [mental: perception] is realized by gaze vectors, for example, a person looking at a fish. Halliday's relational process, existential process, and behavioural process are not included in MDA models. One possible reason may be that it is difficult for pictures to depict these processes. The mismatch between Halliday's and Painter et al's process types restrengthens the necessity of doing the analysis before designing the post-test sheet.

The circumstance information in picture books depicts the physical circumstances in which the characters interact (Painter et. al., 2013). Apart from describing the background of a picture, the circumstance analysis also pays attention to the inter-circumstance relationship (how the depiction circumstance changes between different pages). The inter-circumstance options can either vary in degree or sustain degree, depending on the level of detail provided. The 'vary degree' option (the level of detail of the circumstance changes) can further be divided into 'decontextualization' (circumstantial settings removed from the previous background) or 'recontextualization' (circumstantial settings increased from the previous background). The 'sustain degree' (level of detail of the circumstance does not change) option can be further categorized into 'maintaining context' and 'changing' context according to whether the setting has changed or not.

Appendix K: SFL Experiential Meaning Analysis by Clause

1. Once upon a slime, there was a Slodge.

Clause	Once upon a slime	there	was	a Slodge
Exp	Circumstance		Existential	Existent

2. The first Slodge in the universe.

Clause	(It)	(is)	The first Slodge	in the universe
			Exophoric ellipsis	
Exp	Token	RII	Value	Circumstance

3. She saw the first sunrise. And the first sunset.

Clause	She	saw	the first sunrise. And the first sunset.
Exp	Sensor	Mental	Phenomenon

4. “My day, my night,”
5. she said.

Clause	(It)	(is)	“My day, my night,”		she	said
			Exophoric ellipsis			
Exp	Token	RII	Value + Verbiage		Sayer	Verbal

6. She saw the first star. And the first moon.

Clause	She	saw	the first star. And the first moon.
Exp	Sensor	Mental	Phenomenon

7. “My star, my moon”
8. she said.

Clause	(It)	(is)	“My star, my moon”		she	said
			Exophoric ellipsis			
Exp	Token	RII	Value + Verbiage		Sayer	Verbal

9. She heard the first thunder,

Clause	She	heard	the first thunder
Exp	Sensor	Mental	Phenomenon

10. And saw the first lightning.

Clause	And	(she) ellipsis	saw	the first lightning
Exp			Mental	Phenomenon

11. She smelled the first flower…

Clause	She	smelled	the first flower…
Exp	Behaver	Behavioural	Phenomenon

12. And picked the first fruit.

Clause	And	(she) ellipsis	picked	the first fruit
Exp		(Actor)	Material	Goal

13. “Mine, all mine!”
14. she said.

Clause	(They)	(are)	“Mine, all mine!”		she	said
			Exophoric ellipsis			
Exp	Token	RII	Value		Sayer	Verbal

15. She took a bite of the fruit,

Clause	She	took	a bite of the fruit
Exp	Actor	Material	Range

16. Then went to sleep.

Clause	Then	(she) ellipsis	went to sleep
Exp		Behaver	Behavioural

17. As she slept, she dreamed.

Clause	As she slept,	she	dreamed
Exp	Circumstance	Behaver	Behavioural

18. She was hungry.

Clause	She	was	hungry
Exp	Carrier	RAI	Attribute

19. She woke

Clause	She	woke
Exp	Behaver	Behavioural

20. and went to eat the fruit.

Clause	and	(she) ellipsis	went to eat	the fruit
Exp		Behaver	Behavioural	Phenomenon

21. But somebody had taken a second bite.

Clause	But	somebody	had	taken	a second bite.
Exp		Actor	Material		Range

22. There was another Slodge.

Clause	There	was	another Slodge
Exp		Existential	Existent

23. It was a terrible shock to both of them.

Clause	It	was	a terrible shock	to both of them
Exp	Carrier	RAI	Attribute	Circumstance

24. Each thought

Clause	Each	thought
Exp	Sensor	Mental

25. they were the only one.

Clause	they	were	the only one
Exp	Token	RII	Value

26. “My fruit!”
27. said the First Slodge.

Clause	(It)	(is)	“My fruit!”		said	the First Slodge
			Exophoric ellipsis			
Exp	Token	RII	Value + Verbiage		Verbal	Sayer

28. “My fruit!”
29. said the Second.

Clause	(It)	(is)	“My fruit!”		said	the Second
			Exophoric ellipsis			
Exp	Token	RII	Value + Verbiage		Verbal	Sayer

30. And they fought the first fight.

Clause	And	they	fought	the first fight
Exp		Actor	Material	Goal

31. The fruit rolled down the hill.

Clause	The fruit	rolled	down the hill.
Exp	Actor	Material	Circumstance

32. “Mine!”
33. they said

Clause	(It)	(is)	“Mine!”		they	said
			Exophoric ellipsis			
Exp	Token	RII	Value + Verbiage		Sayer	Verbal

34. as they ran
35. to catch it.

Clause	as	they	ran		to catch	it
Exp		Actor	Material		Material	Goal

36. The fruit fell into the sea.

Clause	The fruit	fell	into the sea
Exp	Actor	Material	Circumstance

37. The First Slodge jumped in after it.

Clause	The First Slodge	Jumped in	after it
Exp	Actor	Material	Circumstance

38. "My sea!"
39. said the First Snawk.

Clause	(It)	(is)	"My sea!"		said	the First Snawk
			Exophoric ellipsis			
Exp	Token	RII	Value + Verbiage		Verbal	Sayer

40. "My Slodge, my supper!"

Clause	(It)	(is)	"My Slodge, my supper!"
			Exophoric ellipsis
Exp	Token	RII	Value + Verbiage

41. And it went to eat her.

Clause	And	it	went to eat	her
Exp		Behaver	Behavioural	Phenomenon

42. The Second Slodge was furious.

Clause	The Second Slodge	was	furious
Exp	Carrier	RAI	Attribute

43. "That's *my* Slodge!"
44. he said.

Clause	That	's	*my* Slodge		he	said
Exp	Token	RII	Value		Sayer	Verbal

45. He jumped in with a splash…

Clause	He	jumped in	with a splash…
Exp	Actor	Material	Circumstance

46. scared away the Snawk,

Clause	scared away	the Snawk
Exp	Material	Goal

47. and saved her.

Clause	and	saved	her
Exp		Material	Goal

48. “You are my friend,”

49. said the First Slodge

Clause	“You	are	my friend”		said	the First Slodge
Exp	Token	RII	Value		Verbal	Sayer

50. “No, you are *my* friend,”

51. said the Second.

Clause	“No	you	are	*my* friend”		said	the Second
Exp		Token	RII	Value		Verbal	Sayer

52. And they shared the fruit and the friendship.

Clause	And	they	shared	the fruit and the friendship
Exp		Actor	Material	Goal

53. The sun went down.

Clause	The sun	went	down
Exp	Actor	Material	Circumstance

54. “Our sunset,”

55. said the First Slodge.

Clause	(It)	(is)	“Our sunset,”		said	the First Slodge
			Exophoric ellipsis			
Exp	Token	RII	Value + Verbiage		Verbal	Sayer

56. “Our moon, our stars”

57. said the Second.

Clause	(It)	(is)	“Our moon, our stars”		said	the Second
			Exophoric ellipsis			
Exp	Token	RII	Value + Verbiage		Verbal	Sayer

58. The world didn’t belong to anyone.

Clause	The world	didn’t	belong to	anyone
Exp	Carrier: Possessor		relational attributive possessive	Attribute: Possessed

59. It belonged to *everyone.*

Clause	It	belonged to	*everyone*
Exp	Carrier: Possessor	relational attributive possessive	Attribute: Possessed

60. It was there
61. to share.

Clause	It	was	there		to share
Exp	Token	RII	Value		Material

62. Once upon a slime, there was two Slodge.

Clause	Once upon a slime,	there	was	two Slodge
Exp	Circumstance		Existential	Existent

63. But not for long…"*Our* babies!"

Clause	But	not for long	(They)	(are)	"*Our* babies!"
					Exophoric ellipsis
Exp		Circumstance	Token	RII	Value

Appendix L: MDA Experiential Meaning Analysis (Action, Circumstance, Processes) and Text-Picture Comparison

Distribution of action in The First Slodge

Spread	Image		Verbiage: transitivity analysis
	Process type	Evidence and interpretation	
1	The First Slodge: Mental perception	Gaze vector: towards the grass	Existential process: there was…
			RII: (It is) The first slodge…
2	The First Slodge: Action transitive	Vector created by arm: pointing to the sun	Mental: She saw the first sunrise. And the first sunset.
			RII: (It is) “My day, my night,”
			Verbal: She said
	The First Slodge: Action transitive	Vector created by arm: pointing to the moon	Mental: She saw the first star. And the first moon.
			RII: (It is) “My star, my moon’’
			Verbal: She said
3	The First Slodge: Mental perception	Gaze vector: towards the lightning, afraid of the lighting	Mental: She heard
			Mental: She saw
	The First Slodge: Action intransitive	Vector created by the foot line: indicating the Slodge is skipping	Behavioural: She smelled
			Material: And picked
	The First Slodge: Action transitive	Vector created by arm: smelling the flower	RII: (They are) “Mine, all mine!”
	The First Slodge: Action transitive	Vector created by arm: picking the fruit	Verbal: She said
4	The First Slodge: Action transitive	Vector created by arm and body: lying on the tree and sleeping	Material: She took a bite of the fruit
			Behavioural: went to sleep.
	The First Slodge: Mental cognition	Vector leading to thought bubble: thinking of the fruit; dream	Behavioural: She dreamed
			RAI: She was hungry.
	The Second Slodge: Mental perception	Gaze vector: gaze towards the fruit, want the fruit	Behavioural: She woke
			Behavioural: and went to eat the fruit
	The First Slodge: Mental	Gaze vector: gaze towards	Material: somebody had

	perception	the fruit, shocked by the second bite	taken a second bite
5	The First Slodge: Action transitive	Vector created by arm: dropping off the fruit	Existential: There was another Slodge
	The First Slodge: Mental perception	Gaze vector: gaze towards the second slodge, shocked	RAI: It was a terrible shock to both of them.
	The Second Slodge: Mental perception	Gaze vector: gaze towards the first slodge, shocked	Mental: Each thought
			RII: they were the only one.
6	The First and the Second Slodge: Mental perception	Gaze vector: gaze towards each other, angry	RII: (It is) “My fruit!”
			Verbal: said the First Slodge
	The First and the Second Slodge: Action transitive*6	Vector created by arms: fighting	RII: (It is) “My fruit!”
			Verbal: said the Second
			Material: they fought the first fight
7	The fruit: Action intransitive	Vector created by lines: roll down the hill	Material: The fruit rolled down the hill.
			RII: (It is) “Mine”
	The First Slodge: Action intransitive	Vector created by arm and lines: chasing the fruit	Verbal: They said
			Material: they ran
	The Second Slodge: Action intransitive	Vector created by arm and lines: chasing the fruit	Material: to catch it
			Material: The fruit fell into the sea.
			Material: The First Slodge jumped in…
8	The First Slodge: Action intransitive	Vector created by arm and the splash: jumping into the water	RII: (It is) “My sea”
			Verbal: said the First Snawk
	The Second Slodge: Mental perception	Gaze vector: gaze towards the first slodge, worried	RII: (It is) “My Slodge, my supper!”
	The First Snawk: Action transitive	Vector created by the mouth: try to eat the first slodge	Behavioural: And it went to eat her.
9	The Second Slodge: Action transitive	Vector created by the body and arm: hit the Snawk	RAI: The Second Slodge was furious.
			RII: “That’s my Slodge!”
	The First Snawk: Action transitive	Vector created by the body and arm: the Snawk spit out the first slodge	Verbal: he said
			Material: He jumped in with a splash…
	The Second Slodge: Action transitive	Vector created by arm: pull the first slodge out of the	Material: scared away the Snawk

		sea	Material: and saved her
	The First Snawk: Mental perception	Gaze vector: gaze towards the first and the second slodge, scared	RII: “You are my friend,”
			Verbal: said the First Slodge
	The First and the Second Slodge: Action transitive	Vector created by arm: hold each other’s sholder	RII: “No, you are *my* friend,”
	The First and the Second Slodge: Action transitive	Vector created by arm: eating the fruit	Verbal: said the Second.
	The First and the Second Slodge: Mental perception	Gaze vector: gaze towards each other, friendship	Material: And they shared the fruit and the friendship.
10	The First and the Second Slodge: Action transitive	Vector created by body: appreciating the sky	Material: The sun went down.
			RII: (It is) “Our sunset,”
			Verbal: said the First Slodge
			RII: (It is) “Our moon, our stars”
			Verbal: said the Second
11	The First and the Second Slodge: Action transitive	Vector created by arm: eating the fruit	Relational attributive possessive: The world didn’t belong to anyone.
			Relational attributive possessive: It belonged to *everyone*
			RII: It was there
	Other animals: Mental perception	Gaze vector: gaze towards slodge	Material: to share
			Existential: there was two Slodge
12	Slodges: Action transitive/intransitive	Vector created by arm and body	RII: (They are) “our babies!”

Distribution of circumstantiation in The first Slodge

Spread	Image: depicted circumstantiation & [inter-circumstance relations]	Verbiage: circumstantial information
1	Grass land	Clause 1: Once upon a slime Clause 2: in the universe (specification of place)
2	Left page: Sunrise scene (sun + sea); sunset scene (sun + mountains) [change context: relocate] Right page: dark night (black sky + mountain + small star and moon) [change context: relocate]	/
3	Left page: Rain scene (Green and grey sky + rain + lightening) [change context: relocate] Right page: [vary degree: decontextualization]	/
4	Left page: [vary degree: decontextualization] Right page: mountainous background (mountains + fruit tree + stones) [vary degree: Recontextualization]	Clause 17: As she slept
5	Two pages, one picture: mountainous background (mountains + fruit tree + stones) [maintain context: same perspective]	Clause 23: to both of them
6	Left page: [vary degree: decontextualization] Right page: [vary degree: decontextualization]	/
7	Two pages, one picture: mountain and sea scene (hill + sea + stones + tree) [vary degree: Recontextualization]	Clause 31: down the hill Clause 36: into the sea Clause 37: after it
8	Two pages, one picture: mountain and sea scene (small hillside + big sea) [maintain context: new perspective]	/
9	Left page: sea scene (big blue water + small hillside) [maintain context: same perspective] Right page: flower land scene; blue background [change context: relocate]	Clause 45: with a splash…
10	Two pages, one picture: night scene (blue star sky + moon + black mountain shadow) [change context: relocate]	Clause 53: down
11	Two pages, one picture: flower land [vary degree: decontextualization]	Clause 62: Once upon a slime,
12	Two pages, one picture: mountainous scene [vary degree: Recontextualization]	Clause 63: for long

Participant depiction of The First Slodge

Spread	Image: character analysis			Verbiage: participant analysis
	Character manifestation	Character appearance	Character relations	
1	The First Slodge [complete]	The First Slodge [appear]	/	Clause 1: a Slodge (Existent) Clause 2: The first Slodge (Value)
2	The First Slodge 1 [complete] The First Slodge 2 [metonymic: shadow] The First Slodge 3 [metonymic: shadow]	The First Slodge 1 [reappear: varied: recede] The First Slodge 2 [reappear: unchanged] The First Slodge 3 [reappear: unchanged]	/	Clause 3: She (Sensor); the first sunrise (Phenomenon); the first sunset (Phenomenon) Clause 4+5: 'My day, my night' (Verbiage + Value); She (Sayer) Clause 6: She (Senser); the first star. And the first moon (Phenomenon) Clause 7+8: 'My star, my moon' (Verbiage + Value); She (Sayer)
3	The First Slodge 1 [complete] The First Slodge 2 [complete] The First Slodge 3 [complete]	The First Slodge 1 [reappear: unchanged] The First Slodge 2 [reappear: increase: garment: flower] The First Slodge 3 [reappear: increase: garment: fruit]	/	Clause 9: She (Senser); the first thunder (Phenomenon) Clause 10: the first lightning (Phenomenon) Clause 11: She (Behaver); the first flower (Phenomenon) Clause 12: the first fruit (Goal) Clause 13+14: 'Mine, all mine!' (Verbiage + Value); She (Sayer)
4	The First Slodge 1 [complete] The Second Slodge 1 [complete] The First Slodge 2 [complete] The Second Slodge 2 [metonymic: shadow]	The First Slodge 1 [reappear: unchanged] The Second Slodge [appear] The First Slodge 2 [reappear: unchanged] The Second Slodge [reappear: unchanged]	The first Slodge & the Second Slodge: [comparison: configurational]	Clause 15: She (Actor); a bite of the fruit (Range) Clause 17: She (Behaver) Clause 18: She (Carrier); hungry (Attribute) Clause 19: She (Behaver) Clause 20: the fruit (Phenomenon) Clause 21: somebody (Actor); a second bite (Range)

5	The First Slodge [complete] The Second Slodge [complete]	The First Slodge [reappear: varied: status: emerge] The Second Slodge [reappear: varied: status: emerge]	/	Clause 22: another Slodge (Existent) Clause 23: It (Carrier); a terrible shock (Attribute) Clause 24: Each (Sensor) Clause 25: they (Token); the only one (Value)
6	The First Slodge*7 [complete] The Second Slodge*7[complete]	The First Slodge [reappear: unchanged] The Second Slodge [reappear: unchanged]	/	Clause 26+27: “My fruit!” (Verbiage + Value); the First Slodge (Sayer) Clause 28+29: “My fruit!” (Verbiage + Value); the Second (Sayer) Clause 30: they (Actor); the first fight (Goal)
7	The First Slodge [complete] The Second Slodge [complete]	The First Slodge [reappear: varied: status: recede] The Second Slodge [reappear: varied: status: recede]	/	Clause 31: The fruit (Actor) Clause 32+33: “Mine!” (Verbiage + Value); they (Sayer) Clause 34+35: they (Actor); it (Goal) Clause 36: The fruit (Actor) Clause 37: The First Slodge (Actor)
8	The First Slodge [complete] The Second Slodge [complete] The First Snawk [complete]	The First Slodge [reappear: unchanged] The Second Slodge [reappear: unchanged] The First Snawk [appear]	/	Clause 38+39+40: “My sea!” (Verbiage + Value); the First Snawk (Sayer); “My Slodge, my supper!” (Verbiage + Value) Clause 41: it (Behaver); her (Phenomenon)
9	The First Slodge 1+2 [complete] The Second Slodge 1+2 [complete] The First Snawk 1+2 [complete] The First Slodge 3 [complete] The Second Slodge	The First Slodge 1+2 [reappear: unchanged] The Second Slodge 1+2 [reappear: unchanged] The First Snawk 1+2 [reappear: unchanged]	/	Clause 42: The Second Slodge (Carrier); furious (Attribute) Clause 43 That (Token); my Slodge (Value) Clause 44: he (Sayer) Clause 45: He (Actor) Clause 46: the Snawk (Goal) Clause 47: her (Goal) Clause 48+49: You (Token); my friend (Value); the First Slodge

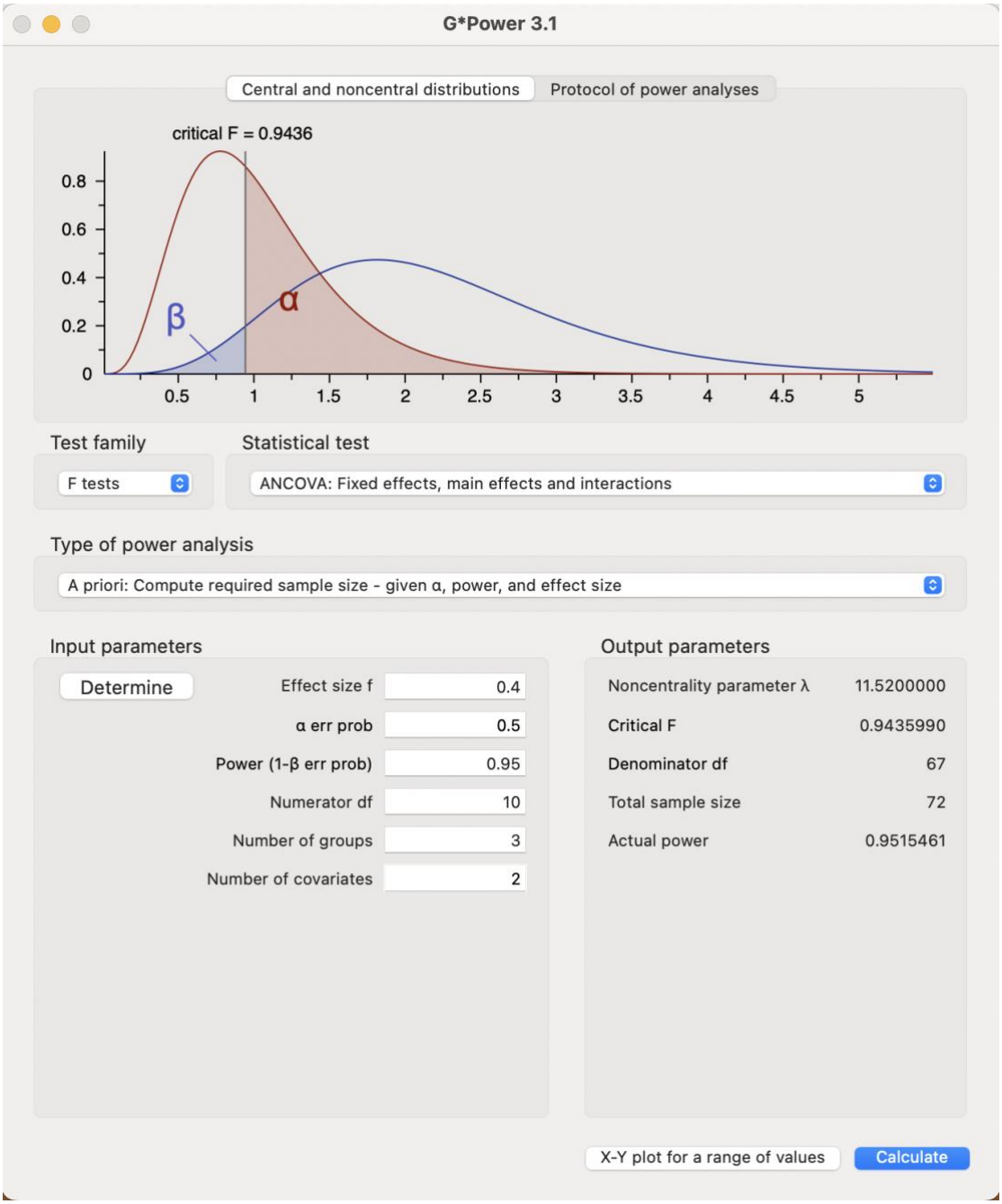
	3 [complete]	The First Slodge 3 [reappear: varied: status: emerge] The Second Slodge 3 [reappear: varied: status: emerge]		(Sayer) Clause 50+51: You (Token); my friend (Value); the Second (Sayer) Clause 52: they (Actor); the fruit and the friendship (Goal)
10	The First Slodge [metonymic: shadow] The Second Slodge [metonymic: shadow]	The First Slodge [reappear: varied: recede] The Second Slodge [reappear: varied: recede]	/	Clause 53: The sun (Actor) Clause 54+55: "Our sunset," (Verbiage + Value); the First Slodge (Sayer) Clause 56+57: "Our moon, our stars"(Verbiage + Value); the Second (Sayer)
11	The First Slodge [complete] The Second Slodge [complete] Many other animals [complete]	The First Slodge [reappear: varied: status: emerge] The Second Slodge [reappear: varied: status: emerge] Many other animals [appear]	/	Clause 58: The world (Carrier: Prossessor); anyone (Attribute: Possessed) Clause 59: It (Carrier: Prossessor); everyone (Attribute: Possessed) Clause 60: It (Token); there (Value) Clause 62: two Slodge (Existent)
12	The First Slodge [complete] The Second Slodge [complete] Many other Slodges [complete]	The First Slodge [reappear: unchanged] The Second Slodge [reappear: unchanged] Many other Slodges [appear]	Slodges: co-classification	Clause 63: "*Our* babies!" (Verbiage + Value)

Appendix M: The Correctness Rate of Each Question of the Post-test

Type	No.	Group	Frequency	Percentage %	Ave. Frequency	Ave. Percentage %
Action	Q1	1	11	33.3	25	25.3
		2	13	39.4		
		3	1	3.0		
	Q2	1	8	24.2	19	19.2
		2	9	27.3		
		3	2	6.1		
	Q3	1	10	30.3	32	32.3
		2	12	36.4		
		3	10	30.3		
	Q4	1	20	60.6	51	51.5
		2	16	48.5		
		3	15	45.5		
	Q5	1	16	48.5	46	46.5
		2	11	33.3		
		3	19	57.9		
Circum	Q1	1	31	93.9	86	86.9
		2	26	78.8		
		3	29	87.9		
	Q2	1	23	69.7	72	72.7
		2	24	72.7		
		3	25	75.8		
	Q3	1	17	51.5	49	49.5
		2	13	39.4		
		3	19	57.6		
	Q4	1	10	30.3	28	28.3
		2	11	33.3		
		3	7	21.2		
	Q5	1	18	54.5	61	61.6
		2	22	66.7		
		3	21	63.6		
partici	Q1	1	22	66.7	62	62.6
		2	20	60.6		
		3	20	60.6		
	Q2	1	20	60.6	60	60.6
		2	18	54.5		
		3	22	66.7		
	Q3	1	24	72.7	71	71.7

		2	23	69.7		
		3	24	72.7		
	Q4	1	22	66.7	61	61.6
		2	17	51.5		
		3	22	66.7		
	Q5	1	23	69.7	54	54.5
		2	16	48.5		
		3	15	45.5		

Appendix N: Power Analysis Results



Appendix O: Descriptive Statistics including Skewness and Kurtosis (Checking for Modality)

Descriptive Statistics for the Whole Dataset:

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Pre_working memory	97	2	13	7.98	1.871	.196	.245	.943	.485
pre_vocab_all	97	4	28	16.12	3.911	.023	.245	.792	.485
all	97	1	14	7.89	2.872	-.153	.245	-.541	.485
post_action	97	0	5	1.75	1.173	.419	.245	-.377	.485
post_circum	97	0	5	2.96	1.190	-.222	.245	-.389	.485
post_participant	97	0	5	3.20	1.419	-.444	.245	-.651	.485
TQ	32	1	7	3.75	1.646	.150	.414	-.488	.809
PQ	32	1	7	4.63	1.641	-.377	.414	-.635	.809
Slodge reading_time	97	0:40:00.00	9:18:00.00	4:34:27.84	1:45:48.86	.669	.245	.260	.485
Valid N (listwise)	32								

Descriptive Statistics for Three Separate Groups:

Descriptive Statistics[a]

Group		N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
		Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
1	Pre_working memory	33	5	13	7.91	1.684	.821	.409	1.243	.798
	pre_vocab_all	33	4	28	15.67	4.128	.296	.409	2.838	.798
	all	33	1	14	8.18	3.015	-.309	.409	-.260	.798
	post_action	33	0	5	1.94	1.273	.603	.409	-.206	.798
	post_circum	33	0	5	2.88	1.293	-.407	.409	-.062	.798
	post_participant	33	1	5	3.42	1.146	-.266	.409	-.467	.798
	Slodge reading_time	33	2:01:00.00	8:51:00.00	5:18:52.73	1:37:20.95	.219	.409	-.217	.798
	Valid N (listwise)	33								
2	Pre_working memory	31	4	13	8.45	2.014	.324	.421	.447	.821
	pre_vocab_all	31	8	25	16.77	3.896	-.389	.421	.296	.821
	all	31	3	14	7.84	3.226	-.036	.421	-1.023	.821
	post_action	31	0	4	1.90	1.274	-.014	.421	-1.133	.821
	post_circum	31	1	5	2.94	1.093	.135	.421	-.238	.821
	post_participant	31	0	5	3.00	1.732	-.288	.421	-1.235	.821
	Slodge reading_time	31	1:43:00.00	9:18:00.00	4:47:48.39	2:02:40.53	.665	.421	-.079	.821
	Valid N (listwise)	31								
3	Pre_working memory	33	2	11	7.61	1.870	-.513	.409	1.167	.798
	pre_vocab_all	33	8	24	15.97	3.737	.132	.409	-.346	.798
	all	33	3	13	7.64	2.396	-.310	.409	-.075	.798
	post_action	33	0	3	1.42	.902	.105	.409	-.639	.798
	post_circum	33	1	5	3.06	1.197	-.239	.409	-.882	.798
	post_participant	33	0	5	3.15	1.349	-.455	.409	-.580	.798
	Slodge reading_time	33	0:40:00.00	6:42:00.00	3:37:30.91	1:06:43.91	.341	.409	2.391	.798
	Valid N (listwise)	33								

a. No statistics are computed for one or more split files because there are no valid cases.

Appendix P: Homogeneity Tests

Homogeneity Test of the ANCOVA Test Investigating the Groups Differences in Answering the Whole Post-test

Levene's Test of Equality of Error Variances[a]

Dependent Variable: all

F	df1	df2	Sig.
1.022	2	94	.364

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Pre_workingmemory + pre_vocab_all + Group

Homogeneity Test of the ANCOVA Test Investigating the Groups Differences in Answering the Action Questions

Levene's Test of Equality of Error Variances[a]

Dependent Variable: post_action

F	df1	df2	Sig.
.631	2	94	.535

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Pre_workingmemory + pre_vocab_all + Group

Homogeneity Test of the ANCOVA Test Investigating the Groups Differences in Answering the Participant Questions

Levene's Test of Equality of Error Variances[a]

Dependent Variable: post_participant

F	df1	df2	Sig.
5.191	2	94	.007

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Pre_workingmemory + pre_vocab_all + Group

Homogeneity Test of the ANCOVA Test Investigating the Groups Differences in Answering the Circumstance Questions

Levene's Test of Equality of Error Variances[a]

Dependent Variable: post_circum

F	df1	df2	Sig.
.845	2	94	.433

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

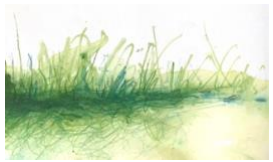
a. Design: Intercept + Pre_workingmemory + pre_vocab_all + Group

Appendix Q: Interview Questions

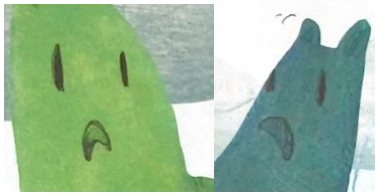
1. Do you know the meaning of the word? (To check children's previous knowledge and whether they can get the rough meaning)
2. How did you guess the meaning? Can you point to the relevant information from the picture book? (To check whether they are referring to pictures or texts)

Appendix R: Interview Transcriptions

Interview Session 1

Words	Interview 1				
	The guessing meaning	Picture reference		Text reference	Other reference
		Verbal	Pointing		
Universe	粘液 Slime	'绿色一团，滑出来的' 'It's a green blob. It slipped out'			**Previous knowledge:** I told children the Slodge came from slime during the story introduction phase before they starting reading the story
Sunrise	日出 Sunrise	'因为这个太阳出来了' 'Because the sun came out'			
Sunset	日落 sunset	'然后太阳下山了' 'then the sun went down behind the mountain'			**Previous Chinese language knowledge:** '太阳下山' the sun went down behind the mountain—In Chinese '太阳 sun' and '山 mountain' is a collocation that frequently occurred together. When Chinese people want to say sunset, they would usually say '太阳下山 the sun went down behind the mountain'

Thunder	雨天 Rainy day	‘因为图片上下暴雨’ 'Because it's raining heavily in the picture'			
Lightning	闪电 Lightening	‘然后这里有个闪电’ 'And then there's a lightning here'			**Previous literature knowledge:** ‘因为前面是下雨，应该是先大范围再是小范围的。它先说它看见了自己的第一个日出，再说雨天里出现了一个闪电’ ‘Because it is raining in previous pages. (In literature’s Environmental Description)’ It should depict a large scope and then zooming in to a small one. Previous page said that it (the First Slodge) has seen his first sunrise (which is big scope), then depicting the lightning in a rainy day.

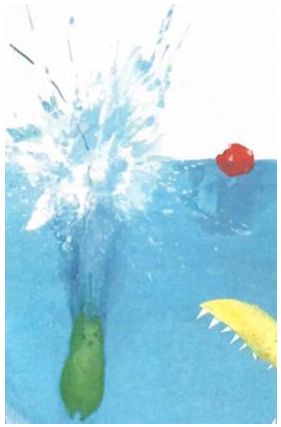
Bite	First guess: 摘 First guess: pick Second guess: 爬 Second guess: climb Third guess: 咬 Third guess: bite	Third guess evidence: '这个水果摘下来是红的，但是这里少了一块' Third guess evidence: 'This fruit is red when picked, but there is a piece missing'	 	The rebut of the first guess: '不是摘，摘前面有了，是 pick' The rebut of the first guess: 'It's not 摘，摘 has appeared in the previous page. 摘 's English word is 'pick'	**Previous English knowledge:** The rebut of the second guess: '不是爬，爬是 climb' The rebut of the second guess: 'It's not 爬. 爬's English word is climb'—previous knowledge
Shock	惊讶 shock	'因为他们第一次见面，表情都很惊讶，嘴巴都歪掉了，手上拿着的水果都掉了' 'Because it was the first time they had met, their facial expressions were all surprised, their mouths were crooked off and the fruit fell out of the hands'	 		
Fight	Participant knew the meaning of this word (previous knowledge)				

Splash	咬 bite	‘好像是咬的意思，就这里它(Snawk)咬住在了它(Slodge)，感觉跟咬着了一样’ 'It seems to mean bite, here it (Snawk) bites this one (Slodge), it feels like it's biting'			
Scare away	打败 beat	‘因为感觉它(Snawk)这里像要逃跑一样’ ‘它脸部表情也是变了的样子’ 'Because it feels like it (Snawk) is trying to escape here' 'It also had a changed expression on its face'		‘因为 save 表示拯救，故事里 the second slodge 拯救了 the first Slodge’ ' Because ‘save’ means 拯救(Chinese meaning of save), and in the story the second slodge saved the first Slodge'	
Furious	愤怒 angry			‘因为 Snawk 要吃 the First Slodge, the second Slodge 去救它 ’ 'Because Snawk was going to eat the First Slodge, the second Slodge went to save it.'	

Interview Session 2

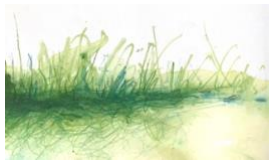
Words	Interview 2				
	The guessing meaning	Picture reference		Text reference	Other reference
		Verbal	Pointing		
Universe	世界 world 一个地方 a place			是一个地方，因为是 in‘ It is a place, because ‘in’ is a preposition	
Sunset	日落 sunset			Sun 是太阳的意思, set 是向下的意思 ‘Sun’ means ‘太阳(sun)’, ‘set’ means go down	
Sunrise	日出 sunrise	我还看到了这个图片 I also saw this picture		因为 sun 是太阳的意思，rise 是上升的意思 Sun’ means ‘太阳(sun)’, ‘rise’ means go up	
Thunder	First guess:阴雨天 First guess: rainy day Second guess: 声音 Second guess: sound		First guess evidence: 	Second guess evidence: Hear 是听到，它听到闪电的声音 **Contextual information of this story:** 闪电	

Lightning	闪电 lightning	而且图片上有闪电 And there is lightning in the picture		Light 是亮的，ing 表示正在进行时 'Light' means bright and 'ing' indicates the ongoing.	**Previous world knowledge:** 闪电劈下来的瞬间是亮的 Lightning is bright at the moment it strikes 闪电存在的时候会带来光 When lightning is present, it brings light
Bite	First guess: 摘 First guess: pick Second guess: 睡觉 (immediately Self-corrected) Second guess: sleep Third guess: 咬 Third guess: bite	因为这里少了一快 Because there is one piece missing here		First guess: 它摘下了水果 The first slodge picked the fruit	**Previous English knowledge:** The rebut of the first guess: 摘是 pick
Shock	First guess: 发现 First guess: find Second guess: 另一个 Second guess: another	Fourth guess evidence: 他们见到了 They met for the first time		Third guess evidence: It was a terrible shock to both of them. 对他们俩来说这是一个很糟糕的事情 It was a very bad thing to both	**Previous English knowledge:** The rebut of the second guess: 另一个是 another The English word for '另一个' is another

	Third guess: 事情 Third guess: a thing Fourth guess: 遇见 Fourth guess: meet			of them	
Fight	打架 fight	他们在图片里抢果子，图片上在打架 They are fighting for the fruit in the picture			
Splash	First guess: 水 First guess: water Second guess: 浪花 Second guess: splash	First guess evidence: 它跳到了海里 Because it jumped into the sea Second guess evidence: 因为它这边溅起了浪花 Because this picture has a splash	First and Second guess evidence 	Second guess evidence: With 是跟随了什么 With means something follows you	

Scare away	害怕地逃走了 Scare away				**Previous English knowledge:** away 是逃走, scary 是害怕 'away' means to flee, scary means to be afraid
Furious	勇敢的 brave			因为 the second slodge 要去救 the first slodge Because the second slodge came to save the first slodge	

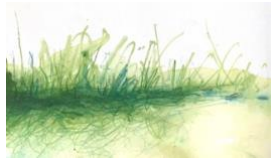
Interview Session 3

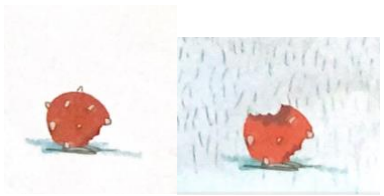
Words	Interview 3				
	The guessing meaning	Picture reference		Text reference	Other reference
		Verbal	Pointing		
Universe	绿色的粘液 Green slime			这句话说 the first slodge in, in 表示在里面 The phrase says the 'first slodge in', 'in' means inside	**Previous knowledge:** I told children the slodge came from slime during the story introduction phase before they starting reading the story
Sunset	日落 sunset	日落是这里没有太阳了			
Sunrise	日出 sunrise	我看到了这张图			
Thunder	First guess:天气不好 First guess: bad weather Second guess: 雷声 Second guess: thunder	在下雨天，天气不好， 这里有雨，天气阴沉 看到了它(The first slodge)的表情不好		Hear 是听到的意思 'hear' means '听到'	

Lightning	闪电 lightning	这里有闪电 There has lighting (in the picture)			**Previous world knowledge:** ‘雷声伴随着闪电’ Thunder and lightning always occur together
Bite	树叶 leaf	这里有个树, 应该是椰子树吧，有叶子 Here is a tree. It should be coconut tree, and it has leaves			
Shock	不开心 unhappy	他们的表情 Their facial expression		**Story contextual information:** 他们第一次见面 They met for the first time	

Fight	打架，争抢 fight				
Splash	水花 splash			with 是随着 with means accompanying sth	
Scare away	Participant knew the meaning of this word (previous knowledge)				
Furious	气愤 angry			**Story contextual information:** The Snawk said the first slodge is his; but the second slodge said he is owning the first slodge. The snawk is going to eat the first slodge	

Interview Session 4

Words	Interview 4				
	The guessing meaning	Picture reference		Text reference	Other reference
		Verbal	Pointing		
Universe	粘液 Slime	应该是这一滩东西 It should be this puddle of stuff			
Sunset	日落 sunset				
Sunrise	日出 sunrise	看这张图片是日出		Sun 是太阳，rise 是升起 Sun’ means ‘太 阳 (sun)’, ‘rise’ means go up	
Thunder	雷声 thunder			Hear means 听 Hear mean listening to some sound	
Lightning	闪电 Lightning				

Bite	咬 Bite	这个图上少了一口，然后又少了一口 There is one bite missing from this picture, then another piece is missing			**Previous knowledge:** 因为前面的题目里问了谁咬了水果 Because the post-test was asking who bite the fruit. It provided me with the Chinese translation: bite means '咬'
Shock	震惊 Shock				**Previous knowledge:** 因为前面的题目里问了谁感到震惊 Because the post-test was asking who feels shocked. And the Chinese translation told me the Chinese meaning of shock
Fight	打架 Fight	因为这张图片 Because of this picture			

Splash	水花 Splash			With 是随着的意思 With means accompanying something	
Scare away	赶走了 Chased away 打走了 Beaten away	因为这里打了它 Because the Snawk was beaten here		Away 表示跑走 Away means go away	
Furious	害怕 Scare			**Story contextual information:** 因为 the first slodge 要被 the Snawk 吃了，the second slodge 来救 the first slodge 。 Because the second slodge come to save the first slodge	

				which was going to be eaten by the Snawk	