

The Application of Digital Picture Books in Cultivating Preschool Children's Language Expression Ability: An Empirical Study

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Abstract

With the rapid development of Information technologies and the wide spread of computing, digital educational resources have become fundamental components of the early childhood education ecosystem instead of novel additions. This research tries to find out how interactive digital picture books affect how little kids use words and talk by looking closely at three main parts: the names and words they get from these books, how sentences are made and joined together, and if stories make sense when read. Utilizing a rigorous quasi experimental pre-post design, the study was comprised of 120 children ages four to five, drawn from two similar demographic kindergartens. The participants were randomly assigned into experimental group where they had access to highly interactive digital picture books and the control group with traditional print picture books with similar storylines. The intervention lasted for 16 weeks: The study showed that while there were developmental improvements for both of the groups, the experimental group's gains were statistically significant within the expressive vocabulary -specifically with verbs, adjectives- and MLU. And, in the qualitative analysis of the narrative retelling task in detail, it was also found that the children who were exposed to the digital format had a better understanding of more complex story structures as well as providing more description. And from the study results, it is seen that digital picture book with synchronized animation, congruent sound and interactive hotspot for teaching purposes as its multimedia component provides important cognitive scaffolding for language output. This gives evidence-based direction to teachers and guardians how to mix digital reading into early reading plans so as to strengthen verbal ability instead of just watching passively.

Keywords

Digital Picture Books; Preschool Education; Language Expression; Vocabulary Acquisition; Multimedia Learning; Early Literacy; Interactive Storytelling; Cognitive Scaffolding.

1. Introduction

Digital tech growing in abundance changes how little ones learn to read at first, making it different from past times where things were written down and shown without moving around; today, kids get involved with stories through many parts at once using their senses. Digital picture books, which can be mainly read through touch screen tablets, interactive whiteboards, or special e-books readers, are a big leap for education media. and they combine traditional text and static illustration with a set of multimedia updates that come with professional auditory narration, character animation, background sounds and touch response[1]. With technology convergence, a special niche is provided to the language for development. In this time of language growth and brain plasticity, the preschool children who need it most can benefit from this. While traditional reading is considered a tried and true part of language development, fostering bonding and a fundamental understanding of literacy, the affordances of digital formats in regards to expressive language, which includes the capacity for producing and

speaking language in order to represent a meaning, thought, and need, remains a very heated topic amongst teachers, students, and researchers. Critics argue that bells and whistles in digital books can distract children from the words, leading to superficial reading and cognitive overload, where kids play with the game instead of the story. On the other hand, supporters argue that properly designed multimedia elements can become like cognitive scaffolds, presenting information in two different codes that make the abstract vocabulary and the complicated sentences in the text more concrete, and easier to remember for our young, preliterate students.

As for what my research would look like, I think it's mainly about trying to get rid of those usual comparisons between "screen time" and "book time," which are often really extreme ways to say something, and instead see how the different parts of using digital picture books can actually help kids speak better in real life. Language expression in preschoolers is a complex concept, it's not just about how many words are used (how many words do I know), but also how well a sentence is constructed (syntax), whether the grammar marker uses is correct, and whether they can tell a story coherently and logically (narration ability) are all included. And although markets for educational apps and electronic books (e-books) are exploding, we have a lacking body of empirical research—how much of those expressive products in controlled educational settings[2]. Most of the existing studies tend to concentrate on what the child hears, or basic comprehension checks, but there is a huge gap between these and understanding the impact digital interactivity has on a child's active verbal production. Conducting comparative analysis on how traditional reading compare to digital, to provide data driven insight on the way we can use digital tools to promote richer and more complex verbal expression within early childhood education[3]. This study answers to a very much needed call for evidence-informed digital pedagogy, so as to help teachers utilize more digital resources that can really foster, rather than inhibit the language development of the "digital-native" generation.

2. Literature Review and Theoretical Framework

Theory underlying this study is heavily grounded with Mayers cognitive theory of multimedia learning and Vygotskys social development theory, which offer a way to look into how digital tech affects cognitive stuff. Mayers theory claims that people have distinct, limited-capacity channels for processing visual and audio information, and deep learning transpires when the learner proactively chooses among, organizes, and fuses these two channels[4]. Regarding digital picture books, it would be natural for the concurrent display of spoken narration (auditory) and illustrated images (visual) to decrease the additional cognitive burden of deciphering text or comprehending still images. "Contiguity Principle" where corresponding words and pictures appear at the same time makes working memory space available for the child so they can process and produce language. Preschoolers who aren't competent enough to read the text can also enjoy it through an audio support: they can bypass the mechanical aspect of reading (i.e., decoding the text) and get to the meaningful or syntactic parts of the language. And then because there's this interactive nature inherent in digital platforms like tapping a character so that they can speak a particular dialogue line, or moving an object within the game world to see what logically results from that action as a kind of active rather than passive consumption. It's the behavioral engagement that is called for by 'deep processing', which is needed if a vocabulary item is to be turned into an expressive state.

But applying such theories to the real area of digital reading is difficult and complex, and it depends largely on the quality of the design. Past research has had mixed results, known as the "Goldilocks effect," too much interactivity is distracting and overwhelming yet too little isn't engaging or different than a regular book. There are also some studies that say "inconsiderate" hotspots- interactive features that aren't part of the story narrative (like pressing a tree that

makes an amusing sound but isn't connected to the plot) can draw attention away from language input, which might lead to worse retention of new words and more choppy understanding. On the contrary, "considerate" features that align with the plot and further the story development can greatly help comprehension. In the eyes of Vygotsky digital picture books have the capacity to act as a "more knowledgeable other" (MKO) by providing prompts, highlighted text and scaffolding which guides the child's understanding within their zone of proximal development (ZPD). But there still is no technology that can replace the interaction in society[5]. The most helpful digital reading environment is often one that promotes "joint media engagement" with a child and an adult or other child. Therefore, we need to understand their influence by seeing how they help change us from taking in language to expressing it with words. This review shows that there's a need to look not only the fact of whether digital books actually do work, but also precisely how the digital books 'multimodal capabilities improve their verbal output specifically over and above understanding.

3. Methodology

This article uses a very strict quasi-experimental pre-test/post-test research design to observe the impact of digital storybooks on children's language expression. Participants came from any 2 equivalent size kindergartens in a big city. Participants will be from the equivalent size kindergartens to guarantee a same type or socioeconomic status, and therefore eliminate other factors for confounding such as the parents education level or home literacy environment. A total of 120 children were randomly selected and divided into the experimental group (digital reading) and the control group (traditional reading). The intervention lasted a considerable length of time of 16 weeks, and there were three 20-minute reading sessions every week, so the total amount of time spent on targeted reading was about 16 hours. As for Experimental Group children, they used tablets with high quality, interactive digital picture book apps. These apps were selected based on the following strict conditions: the coherence between the multimedia components (the animations should match the text), the presence of interactive elements relevant to the story narrative (interactions should help advance the story), and the existence of high-quality human audio voice over narration (text to speech is not preferable). The control group read an exact copy of the stories, but with the print quality. The print sessions controlled for "auditory" by having a teacher read the text out loud with prosody and intonation similar to the digital narration. both groups took part in same post-reading discussion activities so that any difference in the language output would be due to the reading medium instead of the instructional follow-up and teacher talk type.

The table 1 gives the demographic makeup and baseline language proficiency test results of the participants. It is important to keep in mind that baseline assessments were taken in the receptive portion by using the PPVT test, and in the expressive measures with a standard narrative retelling test to make sure that there were no major initial differences between the two groups. Strictly controlling and balancing the subjects according to the selection requirements for men and women and young and old was intended to ensure the internal validity of the experiment[6]. There was extensive data gathering, as there was a record of the children telling stories and spontaneously talking out loud in group reading times at both the beginning (pretest) point and the end (pre-test) point of the intervention. These recordings were then transcribed verbatim and coded by blinded coders for vocabulary diversity (Type-Token Ratio), utterance length (MLU), and narrative structure elements. The combination of standardized tests and natural speech analysis provides a more comprehensive understanding of the children's language development.

Table 1. Demographic Characteristics and Baseline Language Scores of Participants

Characteristic	Experimental Group (n=60)	Control Group (n=60)	t-value / χ^2	p-value
Age (Mean $\pm$ SD)	4.62 $\pm$ 0.35	4.58 $\pm$ 0.38	0.582	0.561
Gender (Boys/Girls)	31 / 29	30 / 30	0.033	0.855
Baseline Vocabulary Score	85.4 $\pm$ 10.2	86.1 $\pm$ 9.8	-0.384	0.702
Baseline MLU	3.12 $\pm$ 0.45	3.15 $\pm$ 0.42	-0.377	0.707

4. Results and Analysis

4.1. Vocabulary Acquisition and Usage

In terms of vocabulary acquisition, we did not just focus on the number of new words the children learned, but on their ability to actively use these new words within context when retelling, differentiating between passive recognition and active usage. The digital picture books utilized in the intervention had definite “hotspots” where touching an object would cause the word to be pronounced along with a corresponding sound/picture effect (such as pressing on a “volcano” would make a rumbling noise, and a volcano eruption animation appear, as well as the word being read out loud “erupt”). As shown in Table 2, the Experimental Group demonstrated a significantly greater increase in target vocabulary use compared to the Control group[7]. While both groups improved (likely due to the natural developmental maturation and repeated listening to those stories), the Experimental Group scored better than the Control Group in using Verbs and Adjectives. This was very important because it pointed out that seeing what actions (verbs) and objects' qualities (adjectives) look like in moving pictures on computers helps people remember them better than looking at regular drawings. Take “scurry” for example – it’s much easier to encode expressively with a child seeing a mouse animated in quickly across the screen, building a dynamic model, as opposed to a still drawing in which the motion has to be inferred abstractly. The digital format can achieve an excellent 'bridge' between words and their dynamic meanings.

Table 2. Comparison of Target Vocabulary Usage in Post-Test Retelling Tasks

Vocabulary Category	Experimental Group (Mean $\pm$ SD)	Control Group (Mean $\pm$ SD)	t-value	p-value	Effect Size (d)
Total Target Words Used	18.4 $\pm$ 3.2	14.1 $\pm$ 2.9	7.72	< 0.001	1.41
Nouns	8.2 $\pm$ 1.5	7.8 $\pm$ 1.4	1.51	0.133	0.27
Verbs	6.5 $\pm$ 1.2	4.1 $\pm$ 1.1	11.42	< 0.001	2.08
Adjectives/Adverbs	3.7 $\pm$ 1.1	2.2 $\pm$ 0.9	8.16	< 0.001	1.49

4.2. Sentence Complexity and Mean Length of Utterance (MLU)

Beyond single-word vocabulary, the study examined the syntactic complexity of the children's language, which is a stronger indicator of overall language proficiency. The Mean Length of Utterance (MLU), calculated by the average number of morphemes per utterance, serves as a reliable index of grammatical development. Table 3 illustrates the pre-test and post-test MLU comparisons. The data reveals that the Experimental Group achieved a significantly higher MLU at the post-test stage. Qualitative analysis of the transcripts indicated that children in the digital group were more likely to use complex sentence structures, such as compound sentences joined by conjunctions and causal connectors (e.g., “because,” “so,” “then,” “if”). This can be attributed to the auditory reinforcement provided by the digital narration, which allows children to hear the prosody, rhythm, and flow of complex syntax repeatedly and consistently. In a traditional

setting, unless a teacher consciously repeats a complex sentence multiple times, the auditory input is transient and fleeting. In the digital format, children often engaged in self-directed repetition, replaying narrative segments they found interesting, effectively drilling the syntactic patterns. Consequently, their expressive output mirrored the complexity of the input they engaged with, demonstrating a clear transfer effect from the digital modeling to their own spontaneous speech production.

Table 3. Pre-test and Post-test Comparison of Mean Length of Utterance (MLU)

Group	Pre-test MLU	Post-test MLU	Mean Increase	t-value (within group)	p-value
Experimental	3.12 \$\pm\$ 0.45	4.45 \$\pm\$ 0.52	+1.33	14.92	< 0.001
Control	3.15 \$\pm\$ 0.42	3.82 \$\pm\$ 0.48	+0.67	8.15	< 0.001
Between-Group Comparison (t-value)	-0.377	6.89			
Between-Group Significance (p-value)	0.707	< 0.001			

4.3. Narrative Competence and Story Structure

The last and likely hardest dimension to evaluate is narrative competence, asking if the child can make a good little story with a clear beginning, middle, and end – with bits about how it all turns out, who wants what, and when stuff happens in the tale. Results, as shown in Table 4, were obtained through a rubric scoring system with a range of 1-5. The Experimental Group performed much better on "Macro-structure" (overall story), "Elaboration" (details). This finding contests the usual objection that digital books are broken up or that activities interrupt the story. But instead, the visual sequencing and the ability to interact with the story elements seems like it helped children internalize the "story grammar." For instance, lots of the interactive features required the child to do something to make the story move forward (helping a character open a door that led to the next scene, etc.), so they had to think about there being a cause and effect between the different parts of the story. In the retelling, these children were able to remember these cause-and-effect links more vividly because they had "done" it in their head. I didn't find support for the "distraction" hypothesis from this data[8]. Rather, it seemed the interactivity acted almost like a mnemonic aid, helping the child to place the plot points somewhere in their episodic memory and giving her a stronger base on which to build a richer, more detailed verbal reconstruction of the storyline.

Table 4. Narrative Competence Assessment Scores (Rubric Scale 1-5)

Assessment Dimension	Experimental Group (Mean \$\pm\$ SD)	Control Group (Mean \$\pm\$ SD)	Difference	Significance
Macro-structure (Plot Coherence)	4.2 \$\pm\$ 0.7	3.5 \$\pm\$ 0.8	+0.7	p < 0.01
Micro-structure (Grammar/Syntax)	3.9 \$\pm\$ 0.6	3.6 \$\pm\$ 0.7	+0.3	p < 0.05
Elaboration (Descriptive Details)	4.5 \$\pm\$ 0.6	3.2 \$\pm\$ 0.8	+1.3	p < 0.001
Character Motivation Recall	4.1 \$\pm\$ 0.8	3.4 \$\pm\$ 0.9	+0.7	p < 0.01

5. Discussion

The findings of this study can offer ample empirical justification for the effectiveness of digital picture books concerning preschool kids language expression mainly concerning depth, syntactic sophistication, and narrative cohesion. The experimental groups far better performance in learning verbs and adjectives strongly supports the embodiment in a digital sense. When children touch the screen to get a character jumping, shivering, sliding, rolling, etc., the meaning of the verb is physically and visually reinforced using the child's own agency, thus leaving a stronger impression than an image alone. Multimodal input provides a more plentiful mental "lexical entry" for the child, and they have an easier time retrieving and using the word properly when speaking next time around[9]. and the much larger MLU shows that the repeated, consistent auditory modeling provided by the e-books is an adequate way for implicit grammar learning. Unlike a human reader who would inadvertently alter his intonation, skip sentences, or read more quickly as he was weary, the digital narrator gives children a steady, high-quality language model for imitation that allows them to speak with longer and more complex phrases. But we must interpret the positive results with a grain of salt about the quality of the materials used here which are digital. The App I chose from this list were thought through and chosen only if the interactions needed or thought to be necessary for the story and moving it forward. It differs in that other studies which found negative effects were because of distracted games and unrelated "hotspots" or "pop-up" interruptions that broke up the story. the success of the intervention depended greatly on whether the interaction went along with the story[10]. This means that the medium itself (digital versus paper) isn't the key. It's how the medium is designed. Digital picture books are not magic solutions, They're tools that, when combined with the principles of multimedia learning, can involve children in a way that allows for their language to take an active part. By way of the digital format's visual and auditory scaffolding, children gain ability to make language that just above what they can create on their own, and are thereby operating in their ZPD by gaining the support needed to construct meaning before being able to do it on their own.

6. Conclusion

In total, it can be seen that high-quality, pedagogically developed digital picture books are effective pedagogical tools for language expression in preschool children. Clearly from this data we can say that digital reading interventions are leading to greater gains in students ability to demonstrate expressive vocabulary, specifically for action verbs and descriptive adjectives, but also greater gains in sentence length and both syntactical and narrative structure. When the elements of animation and sound are integrated appropriately with the text, they work like cognitive supports to help young kids who can understand things, but aren't good at saying them out loud. These are very important results for the people who work with very young children, the teachers who write class lessons, and the computer experts who create programs for schools. It means that digital reading is not a mere pastime or passive "babysitter," instead it is an legitimate, forceful part of a child's early literacy training.

Moving forward, we must also encourage educators and parents to create a digital library for their children, but prioritize educating them over entertainment, and apps that tell a narrative instead of just superficial interaction or gamification. Education policy needs to show this by setting up rules for judging app quality based on how well stories are mixed in, not just what it looks like on the screen. Future research can build off them by looking at long-term language improvement and different kinds of grown-up helping-like parents reading along with digital stories or kids reading alone with digital hints-that can change those effects. In the end it is always about taking advantage of the huge appeal and strength of digital technology to create

wonderful immersive environments for children to thrive in the future digital world, helping them become confident, articulate communicators.

References

- [1] Liu, Y. Q. (2023). A study on the design of interactive digital narrative books for children's cultural acquisition [Master's thesis]. Jiangnan University.
- [2] Cao, M. S., & Jin, F. (2025). Digital technology empowering embodied picture book teaching in kindergartens: Theoretical analysis, framework design and practical exploration. *Journal of Heilongjiang Institute of Teacher Development*, 44(9), 144-149.
- [3] Lu, S. X. (2025). The impact of kindergarten classroom language and literacy environment quality on young children's language school readiness development [Master's thesis]. Guangxi Normal University.
- [4] Wen, J. (2023). Research on the application of interactive picture book design under the children's cognitive theory [Master's thesis]. Anhui Jianzhu University.
- [5] Ma, K. N. (2025). An analysis of the application of digital picture books in improving young children's language expression ability. *Taste·Classics*, (13), 63-66.
- [6] Xu, Y. N. (2018). A study on the correlation between family art education of preschool children and the drawing and storytelling ability of 3-4-year-old children. *Think Tank Era*, (43), 297-298.
- [7] Du, Y. (2025). The in-depth impact and innovative transformation of digital technology on contemporary picture book creation. *Art Panorama*, (30), 22-24.
- [8] Zhu, L., Li, D., & Wang, Z. X. (2025). Research on the design of children's popular science picture books under the cognitive theory. *Screen Printing*, (17), 54-56.
- [9] Li, W. (2017). The impact of electronic reading and picture book reading on the narrative performance of 5-6-year-old children [Master's thesis]. Jiangsu Normal University.
- [10] Li, W., & Wang, J. (2017). The impact of reading media on the story generation of 5-6-year-old children: A comparative study based on digital reading and picture book reading. *E-education Research*, 38(6), 95-102+110.