

Enhancing Emergent Literacy Skills via Interactive Storytelling: Insights into Early Vocabulary Acquisition

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ABSTRACT

Traditional early literacy instruction often relies on decontextualized letter drilling, failing to foster integrated decoding and semantic comprehension. This study investigated the impact of a scaffolded interactive storytelling intervention on enhancing preschoolers' emergent literacy skills and early vocabulary acquisition. Grounded in a design-based practitioner inquiry framework, the intervention was implemented across two sequential phases with 13 preschoolers aged 5 to 6 years ($M = 5.4$, $SD = 0.38$). Data were gathered using a validated observation rubric ($CVI = 0.92$; $k = 0.84$) assessing grapheme-phoneme identification, word-picture association, and contextual word comprehension. Wilcoxon Signed-Rank Tests revealed a statistically significant improvement in overall emergent literacy performance from baseline ($M = 1.92$, $SD = 0.81$) to Phase II ($M = 3.08$, $SD = 0.86$; $Z = -3.18$, $p < 0.001$), yielding a large cumulative effect size ($r = 0.88$). Qualitative classroom observations confirmed a behavioral shift from passive memorization to active dialogic engagement, self-correction, and communicative confidence. Synthesizing Dual Coding Theory and Vygotsky's Social Constructivism, these findings demonstrate that combining multimodal storybooks with dialogic questioning activates dual verbal and non-verbal cognitive channels, bridging orthographic decoding with semantic mapping. This study provides a theoretically sound, scalable model for reforming early childhood literacy curricula toward interactive, narrative-driven practices.

Keywords: Emergent Literacy, Interactive Storytelling, Vocabulary Acquisition, Preschoolers



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1. INTRODUCTION

Early childhood literacy development is recognized as a dynamic process that establishes foundational language and literacy skills associated with subsequent school readiness and longer-term academic achievement (Bleses et al., 2021; Kwok et al., 2021; Logan et al., 2024). Within this developmental continuum, emergent literacy skills, including phonological awareness, print awareness, alphabet knowledge, and letter-sound knowledge, constitute important foundations for subsequent formal reading and writing development in the early school years (Bigozzi et al., 2023; Hodges et al., 2024; Werfel et al., 2023). Central to this developmental foundation is early vocabulary acquisition, as preschool oral language skills contribute to subsequent word reading and reading comprehension by supporting the development and integration of phonological, lexical, and orthographic representations (Jago et al., 2025; Pan et al., 2022). Despite its critical importance, vocabulary acquisition is not always effectively operationalized in early childhood pedagogy, where conventional instruction often relies heavily on rote memorization, decontextualized letter drilling, and flashcard repetition (Madsen et al., 2023; Olszewski & Hood, 2023). These mechanistic approaches reduce language learning to isolated skill exercises, failing to engage

children's semantic processing or stimulate the socio-cognitive engagement necessary for deep lexical integration. In response, recent evidence underscores that vocabulary acquisition is significantly more effective when explicit instruction is meaningfully integrated with shared storybook reading, teacher–child dialogic interaction, and contextual knowledge-building activities (Neuman et al., 2025; Neuman & Kaefer, 2025).

To address the limitations of narrowly skill-focused literacy instruction, recent research has increasingly highlighted interactive and narrative-based approaches, particularly shared and interactive storybook reading, as pedagogically meaningful contexts for supporting young children's language and literacy development (Hamilton et al., 2021; Van Elsen et al., 2024; Wauters & Dirks, 2024; Weadman et al., 2023). Unlike passive listening, interactive storytelling can function as a multimodal pedagogical intervention by integrating visual storybook illustrations, teacher gestures, contextual meaning-making, and dialogic questioning to foster children's active participation in language and literacy learning (Neugebauer et al., 2025; Nicolopoulou et al., 2024; Vaknin-Nusbaum & Nevo, 2021; Wu et al., 2025).

From a theoretical standpoint, the efficacy of interactive storytelling in supporting vocabulary acquisition is grounded in Paivio's Dual Coding Theory and Vygotsky's Social Constructivism. Dual Coding Theory posits that learning is facilitated when verbal information is processed concurrently with complementary non-verbal representations (Chalil & Naomi, 2026; Kalender, 2026). In interactive storytelling, spoken narratives and target vocabulary can therefore be integrated with visual storybook illustrations and meaningful gestures, creating multiple representational pathways for encoding and retrieving linguistic information. Recent research supports this multimodal mechanism, showing that visual-graphic representations and teacher gestures can bridge verbal and visual information during interactive storybook reading, thereby supporting children's language and literacy learning (Neugebauer et al., 2025; Vaknin-Nusbaum & Nevo, 2021).

Complementing this cognitive perspective, Vygotsky's Social Constructivism emphasizes that learning occurs through socially mediated interaction and scaffolding within the learner's Zone of Proximal Development (ZPD) (Lambright, 2024; Margolis, 2020; Ness, 2022). Through dialogic scaffolding, educators dynamically prompt, question, elaborate on, and respond to children's contributions, enabling children to participate in meaning-making beyond what they could accomplish independently. Recent evidence demonstrates that open-ended and experience-based questions during shared-book reading elicit greater verbal responsiveness from preschool children, while explicit and interactive vocabulary instruction enhances word learning (Madsen et al., 2023; Wu et al., 2025). Taken together, Dual Coding Theory and Vygotsky's Social Constructivism provide complementary explanations for how interactive storytelling may facilitate vocabulary acquisition: the former emphasizes the integration of verbal and non-verbal representations, whereas the latter emphasizes socially mediated dialogue and instructional scaffolding. This bimodal cognitive processing system may enable young learners to connect abstract linguistic forms with concrete visual and contextual meanings, thereby supporting both receptive and expressive vocabulary development.

Although a substantial body of research has established the developmental benefits of storytelling and shared book reading in early childhood, important conceptual, methodological, and empirical gaps remain in the current scholarship (Galea et al., 2025; Xing et al., 2025). Existing literature has increasingly examined shared book reading as a context for supporting oral language, narrative development, vocabulary, and emergent literacy; however, comparatively less attention has been devoted to the specific instructional mechanisms through which interactive storytelling may influence distinct dimensions of emergent literacy (Shen & Del Tufo, 2022; Weadman et al., 2022). In particular, emerging research highlights the need to examine how specific instructional practices, such as dialogic prompts, vocabulary-focused interactions, print-related strategies, and phonological-awareness activities, contribute to children's literacy development during shared book reading (Olszewski & Hood, 2023; Weadman et al., 2022). Furthermore, recent evidence indicates that the processes underlying children's word learning during shared book reading remain incompletely understood, with children's prior vocabulary knowledge and executive functions influencing how new words are learned from print and digital books (Diprossimo & Cain, 2025). Similarly, meta-analytic evidence demonstrates substantial heterogeneity in the effects of interactive reading, with intervention duration, children's age, and interaction partners moderating outcomes, underscoring the need for research that more precisely examines how interactive storytelling operates across developmental and instructional conditions (Xing et al., 2025).

To address these empirical and theoretical limitations, this study investigates the impact of an interactive storytelling intervention on enhancing emergent literacy skills, with a specific focus on the trajectory of early vocabulary acquisition in preschoolers aged 5 to 6 years. By examining the operational dynamics of picture-book integration, teacher scaffolding, and interactive dialogic engagement, this research seeks to unpack how young learners construct word meanings, associate graphical representations with phonological outputs, and internalize novel vocabulary within a collaborative classroom environment. Specifically, this research addresses two central research questions: (RQ1) How does the implementation of scaffolded interactive storytelling influence the progression of preschoolers' emergent literacy skills, particularly in letter-sound identification and word-picture matching? and (RQ2) To what extent does

interactive storytelling facilitate early vocabulary acquisition and contextual word comprehension among young learners across sequential instructional phases? By addressing these questions, this study contributes to the global literature on early childhood literacy by providing an evidence-based, theoretically grounded framework for reconceptualizing traditional storybook routines into interactive, multimodal language experiences.

2. METHOD

This study employed a sequential intervention design informed by educational design research principles and embedded within a practitioner inquiry model to systematically implement, evaluate, and refine an interactive storytelling intervention across two sequential instructional phases. Educational design research is characterized by iterative development and evaluation of interventions in authentic educational contexts, with the dual aim of addressing practical problems and generating theoretically informed knowledge (McKenney & Reeves, 2021). The design therefore enabled continuous tracking of children's emergent literacy progression under naturalistic classroom conditions while generating both quantitative trajectory measurements and qualitative contextual insights.

Participants comprised 13 preschool children aged 5 to 6 years ($M = 5.4$ years, $SD = 0.38$; 6 boys and 7 girls) selected through purposive sampling. Selection was based on baseline diagnostic observations indicating underdeveloped emergent literacy skills, particularly in letter-sound identification and word-picture matching. Prior to data collection, ethical approval was secured from the institutional review board. Written informed consent was obtained from all parents or legal guardians, while verbal assent was gathered from the children before each session. All participant data were anonymized using pseudonyms to protect confidentiality.

The intervention was operationalized through a scaffolded interactive storytelling protocol conducted over two sequential cycles spanning four weeks per cycle, with three 30-minute sessions per week. During the pre-intervention baseline phase, conventional literacy instruction was observed, consisting primarily of isolated flashcard drills and passive letter-repetition exercises. In Phase I, scaffolded interactive storytelling was introduced using big picture-books with predictable text patterns. Each session followed a three-tier structure comprising pre-reading activities to activate prior knowledge and introduce visual vocabulary, during-reading routines involving dialogic questioning, targeted vocal inflection, and graphic-phoneme prompting, and post-reading word-picture matching tasks. Building upon reflective evaluations from Phase I, Phase II incorporated enhanced multimodal scaffolding. In this phase, children actively manipulated tactile word-picture cards, engaged in peer-assisted story retelling, and performed individual letter-sound association tasks under structured teacher guidance.

Children's emergent literacy performance was evaluated across baseline, Phase I, and Phase II using a validated Emergent Literacy Observation Rubric. The rubric operationalized emergent literacy across three core sub-dimensions scored on a four-point scale: grapheme-phoneme identification measuring letter recognition and sound production, word-picture association assessing the matching of written words with visual representations, and contextual word comprehension evaluating the explanation of target word meanings within narrative contexts. Content validity was established by a panel of three early childhood education experts, yielding a Content Validity Index of 0.92. To ensure measurement reliability, two independent observers simultaneously scored children's performances during classroom tasks. Inter-rater agreement was evaluated using Cohen's Kappa, yielding a high level of inter-rater reliability across all observation points ($k = 0.84$).

Data were analyzed using a convergent mixed-methods approach to address the research questions comprehensively. Given the sample size of 13 participants, non-parametric statistical techniques were employed for quantitative data. Descriptive statistics, including means, standard deviations, medians, and percentages, were calculated for each assessment phase. The Wilcoxon Signed-Rank Test was performed to determine statistically significant gains in emergent literacy scores across phases, specifically comparing baseline to Phase I and Phase I to Phase II. Effect sizes were computed using Rosenthal's formula ($r = Z / \sqrt{N}$), where r values of 0.1, 0.3, and 0.5 represented small, medium, and large effect sizes, respectively. Complementing the quantitative analysis, qualitative data derived from observational field notes, teacher interview transcripts, and session documentation were subjected to thematic analysis. Inductive coding was applied to capture qualitative behavioral shifts, including children's engagement levels, vocal confidence, and self-correction strategies during storytelling activities.

3. RESULTS

3.1. Baseline Assessment of Emergent Literacy

Prior to the implementation of the interactive storytelling intervention, a comprehensive diagnostic assessment was conducted to establish the baseline emergent literacy levels of all participants ($N = 13$) using the Emergent Literacy Observation Rubric. The baseline evaluations revealed that children exhibited marked difficulties across foundational literacy indicators, yielding an overall mean performance score of

$M = 1.92$ ($SD = 0.81$) on a 4-point scale. As presented in Table 1, 4 children (30.77%) were classified as Not Yet Developed, 3 children (23.08%) as Beginning to Develop, 6 children (46.15%) as Developing as Expected, and 0 children (0.00%) reached the Developing Very Well category.

Table 1. Baseline Emergent Literacy Achievement Categories

Developmental Category	Operational Definition / Score	Number of Children (n)	Percentage (%)
Not Yet Developed (NYD)	Score 1 (Requires continuous prompting)	4	30.77%
Beginning to Develop (BTD)	Score 2 (Requires partial guidance)	3	23.08%
Developing as Expected (DAE)	Score 3 (Performs independently)	6	46.15%
Developing Very Well (DVW)	Score 4 (Exceeds developmental expectations)	0	0.00%
Total		13	100.00%

A granular analysis of the operational sub-dimensions identified two core cognitive deficits hindering children's reading readiness. First, children demonstrated impaired grapheme-phoneme correspondence, exhibiting significant ambiguity when mapping abstract graphical letter symbols onto their corresponding auditory sounds. Most participants relied on arbitrary guessing rather than systematic decoding, frequently confusing phonetically similar consonants or failing to isolate initial letter sounds. Second, marked deficiencies were observed in word-picture association. While some children could recite isolated letters during structured flashcard drills, they struggled to connect written orthographic strings with concrete visual referents. When presented with simple vocabulary words alongside illustrative cards, participants failed to construct semantic linkages without explicit verbal prompting from the teacher, confirming that conventional, decontextualized instructional practices produced fragmented decoding skills without establishing meaningful vocabulary acquisition.

3.2. Overall Emergent Literacy Trajectory Across Phases

To evaluate the developmental trajectory of children's emergent literacy skills across the sequential intervention phases, quantitative data gathered at Baseline, Phase I, and Phase II were statistically analyzed. The implementation of the scaffolded interactive storytelling intervention yielded substantial, progressive gains in participants' overall literacy performance. As detailed in Table 2, the proportion of children achieving developmental competency (combining the Developing as Expected [DAE] and Developing Very Well [DVW] categories) rose from 46.15% at Baseline to 61.54% in Phase I, ultimately reaching 84.62% by the end of Phase II.

Table 2. Descriptive and Inferential Statistics for Emergent Literacy Skills Across Intervention Phases

Phase	NYD n (%)	BTD n (%)	DAE n (%)	DVW n (%)	M	SD	Comparison Phase	Z	p	r
Baseline	4 (30.77)	3 (23.08)	6 (46.15)	0 (0.00)	1.92	0.81	Baseline vs. Phase I	-2.83	0.005	0.78
Phase I	2 (15.38)	3 (23.08)	6 (46.15)	2 (15.38)	2.62	0.96	Phase I vs. Phase II	-2.71	0.007	0.75
Phase II	1 (7.69)	1 (7.69)	7 (53.85)	4 (30.77)	3.08	0.86	Baseline vs. Phase II	-3.18	<0.001	0.88

Note. NYD = Not Yet Developed; BTD = Beginning to Develop; DAE = Developing as Expected; DVW = Developing Very Well. Mean (M) and Standard Deviation (SD) were computed on a 4-point rubric scale. Effect sizes (r) were calculated using Rosenthal's formula ($r = Z / \sqrt{N}$).

Because the dataset comprised a small sample ($N = 13$), non-parametric Wilcoxon Signed-Rank Tests were performed to test for statistically significant differences across instructional phases. The transition from Baseline to Phase I demonstrated a statistically significant improvement in emergent literacy scores ($Z = -2.83$, $p = 0.005$), accompanied by a large effect size ($r = 0.78$). During Phase I, children began responding positively to the structured storybook reading, dialogic questioning, and visual vocabulary prompts. The number of children requiring continuous individual guidance decreased, while 2 participants advanced to the highest competency category (DVW).

Further refinements implemented in Phase II (including enhanced multimodal scaffolding, tactile word-picture card manipulation, and peer-assisted retelling) produced additional statistically significant gains compared to Phase I ($Z = -2.71$, $p = 0.007$, $r = 0.75$). When evaluating cumulative growth from Baseline to Phase II, the non-parametric analysis revealed a highly significant positive transformation in children's literacy proficiency ($Z = -3.18$, $p < 0.001$). The cumulative effect size of $r = 0.88$ far exceeds the standard threshold for a large effect ($r \geq 0.50$), demonstrating that the interactive storytelling framework

exerted a powerful and practically meaningful impact on preschoolers' early word recognition and vocabulary acquisition trajectories.

3.3. Progression in Specific Sub-Dimensions

To address the two research questions comprehensively, a granular analysis was performed across the three operational sub-dimensions of emergent literacy: Grapheme-Phoneme Correspondence, Word-Picture Association, and Contextual Vocabulary Acquisition. As summarized in Table 3, participants demonstrated steady, significant performance gains across all three operationalized domains from Baseline through Phase II.

Table 3. Sub-Dimensional Mean Scores and Standard Deviations Across Instructional Phases

Sub-Dimension	Baseline M(SD)	Phase I M(SD)	Phase II M(SD)	Primary Research Alignment
Grapheme-Phoneme Correspondence	1.85 (0.80)	2.54 (0.88)	3.00 (0.82)	Research Question 1 (RQ1)
Word-Picture Association	1.92 (0.86)	2.69 (0.95)	3.15 (0.90)	Research Question 1 (RQ1)
Contextual Vocabulary Acquisition	2.00 (0.82)	2.62 (0.96)	3.08 (0.86)	Research Question 2 (RQ2)

Note. Scores are based on a 4-point rubric scale: 1 = Not Yet Developed; 2 = Beginning to Develop; 3 = Developing as Expected; 4 = Developing Very Well.

In response to Research Question 1 (RQ1), regarding the progression of letter-sound identification and word-picture matching, the quantitative metrics reveal a strong positive developmental trajectory. For Grapheme-Phoneme Correspondence, mean scores improved from $M = 1.85$ ($SD = 0.80$) at Baseline to $M = 2.54$ ($SD = 0.88$) in Phase I, ultimately reaching $M = 3.00$ ($SD = 0.82$) in Phase II. Children shifted from passive letter memorization to active orthographic mapping, demonstrating marked improvement in isolating initial phonemes and correctly associating letter symbols with spoken sounds. Concurrently, performance in Word-Picture Association advanced from $M = 1.92$ ($SD = 0.86$) at Baseline to $M = 2.69$ ($SD = 0.95$) in Phase I and $M = 3.15$ ($SD = 0.90$) in Phase II. The introduction of interactive big picture-books allowed young learners to bridge abstract printed text with vivid visual referents. By Phase II, children accurately selected and matched printed vocabulary cards with corresponding illustrative depictions with minimal teacher prompting.

In response to Research Question 2 (RQ2), concerning the extent to which interactive storytelling facilitates early vocabulary acquisition and contextual word comprehension, performance in Contextual Vocabulary Acquisition registered a continuous upward trend, progressing from $M = 2.00$ ($SD = 0.82$) at Baseline to $M = 2.62$ ($SD = 0.96$) in Phase I, and culminating at $M = 3.08$ ($SD = 0.86$) in Phase II. The dialogic scaffolding embedded within storytelling sessions, specifically open-ended questioning, teacher vocal inflections, and targeted repetition, significantly enhanced children's semantic comprehension. Rather than merely reciting isolated words, participants developed the capacity to articulate word meanings within the context of the story, correctly identify novel target vocabulary, and expressively utilize learned terms during peer-assisted story retelling activities. These sub-dimensional findings confirm that interactive storytelling serves as a powerful pedagogical tool for simultaneous orthographic decoding and contextual lexical integration.

3.4. Qualitative Classroom Observations and Micro-Interactions

Complementing the quantitative findings, thematic analysis of qualitative field notes, classroom observational records, and teacher interview transcripts illuminated a profound shift in children's behavioral and cognitive engagement across the intervention phases. During the pre-intervention baseline phase, learning behavior was characterized by passivity and cognitive disinterest. Children passively repeated letter sounds during decontextualized flashcard drills, exhibiting low attention spans, frequent off-task behaviors, and heavy reliance on immediate teacher prompting.

The introduction of interactive storytelling initiated a marked transition toward active dialogic engagement. Classroom micro-interactions revealed that the integration of big picture-books, expressive vocal inflections, and open-ended questioning transformed storytelling from a passive listening task into a collaborative cognitive activity. Field observations during Phase I captured children actively leaning forward, pointing toward target visual illustrations, and spontaneously vocalizing letter sounds when introduced to new story vocabulary. Teacher dialogic scaffolding (such as strategic pausing and verbal prompting) encouraged children to make predictions, connect target words with picture cards, and discuss word meanings within the narrative context rather than memorizing abstract letter strings.

By Phase II, micro-interactions demonstrated the emergence of self-correction strategies and enhanced vocal confidence during literacy tasks. Rather than waiting passively for teacher feedback,

children began monitoring their own reading attempts. For example, during word-picture matching exercises, several children independently noticed orthographic mismatches, adjusted their initial letter-sound pronunciations, and corrected card placements through peer collaboration and teacher encouragement. Furthermore, qualitative records highlighted a noticeable rise in children's enthusiasm, oral participation, and confidence during peer-assisted story retelling. Children willingly volunteered to articulate novel vocabulary words aloud, matching them with visual illustrations in front of the class. These qualitative observations confirm that the interactive storytelling framework successfully restructured the classroom environment from rigid, rote memorization into a dynamic socio-cognitive space that nurtured both emergent literacy competence and learner agency.

4. DISCUSSION

4.1. Interpretation of Core Findings and Alignment with Early Literacy Frameworks

The empirical findings of this study provide robust quantitative evidence that a scaffolded interactive storytelling intervention drives a transformative shift in young learners' emergent literacy development. The overall mean score progressed substantially from baseline ($M = 1.92$, $SD = 0.81$) to Phase II ($M = 3.08$, $SD = 0.86$), culminating in a statistically significant transformation ($Z = -3.18$, $p < 0.001$). The observed effect size ($r = 0.88$) far exceeds the conventional benchmark for a large effect ($r \geq 0.50$), indicating that the intervention exerted a profound and practically meaningful impact on preschoolers' literacy trajectories. When contextualized within recent international literature, the magnitude of improvement observed in the present study is notably pronounced relative to effect sizes reported in contemporary meta-analytic research on shared and interactive reading. Recent evidence indicates that home-based shared book reading is positively associated with children's language ($r = 0.381$) and vocabulary development ($r = 0.314$) (Galea et al., 2025), while interactive reading interventions produce a medium aggregate effect on young children's narrative abilities (Xing et al., 2025). More recent meta-analytic evidence further demonstrates substantial effects of dialogic reading on broader reading literacy outcomes, including decoding and comprehension, although effect sizes vary according to children's age and measurement type (Tang et al., 2026). Against this empirical context, the effect observed in the present study ($r = .88$) represents a comparatively large intervention effect. However, this magnitude should be interpreted cautiously because the present study differs from prior meta-analytic evidence in sample size, intervention structure, outcome measures, and research design. The particularly pronounced improvement may plausibly reflect the multi-layered scaffolding embedded in Phase II, which combined visual storybook exposure with hands-on orthographic card manipulation, targeted vocal inflections, and structured peer-assisted retelling routines.

Beyond statistical metrics, these results provide empirical support for foundational theoretical models of early reading acquisition. According to the Simple View of Reading (SVR), reading comprehension emerges from the interaction between decoding and language comprehension, conventionally represented as $R = D \times C$ (Hoover, 2024; Tapia Montesinos et al., 2022). Recent empirical research continues to support the relevance of these two components while demonstrating that their relative contributions may vary according to language, developmental stage, and learner characteristics (Bellocchi et al., 2025; Cole et al., 2023; Nordström et al., 2025). The baseline diagnostic data illustrated that conventional instruction centered exclusively on isolated flashcard drills was insufficient to foster functional reading skills because it treated decoding as a largely isolated mechanical exercise without sufficiently integrating linguistic meaning. In contrast, the interactive storytelling model operated as a dual-component pedagogical framework that simultaneously supported both dimensions of the SVR. By embedding grapheme-phoneme recognition tasks within meaningful narrative contexts, the intervention supported the development of orthographic decoding skills (D) while simultaneously providing opportunities to expand receptive and expressive vocabulary as components of language comprehension (C).

Furthermore, these findings strongly resonate with contemporary conceptualizations of emergent literacy that emphasize the interconnected development of language-related and code-related skills. Recent meta-analytic evidence demonstrates that language skills, such as vocabulary, and code skills, such as phonological awareness, are significantly related in preschool children and that interventions targeting both domains can produce comparable or greater outcomes than interventions emphasizing only one domain (Cusiter et al., 2025). Within this integrated perspective, the present findings suggest that interactive storytelling provided a meaningful instructional context in which language-rich narrative experiences and explicit code-related activities could operate concurrently. By engaging preschoolers in dialogic questioning and multimodal word-picture matching within narrative contexts, the intervention connected vocabulary and meaning-making with grapheme-phoneme recognition, potentially facilitating coordination between language and code-related emergent literacy skills. Consequently, interactive storytelling may function not merely as a passive listening activity but as an integrated pedagogical approach that combines meaning-focused language learning with explicit print-related learning, thereby supporting early word recognition and vocabulary development.

4.2. Cognitive Mechanisms of Dual Coding in Word Recognition and Matching

The substantial progression observed in Grapheme-Phoneme Correspondence ($M = 3.00$, $SD = 0.82$) and Word-Picture Association ($M = 3.15$, $SD = 0.90$) directly addresses Research Question 1 by demonstrating substantial gains in early word-recognition-related skills following the interactive storytelling intervention. The cognitive mechanisms underlying these gains can be interpreted through Paivio's Dual Coding Theory, which proposes that learning can be supported when verbal information is accompanied by complementary visual representations. Recent research with preschool-aged dual language learners demonstrates that educational media combining verbal and visual supports can facilitate vocabulary learning, consistent with the premise that linguistic and non-linguistic representations can jointly support learning and recall (Wong et al., 2021). In the present intervention, printed target vocabulary was presented alongside storybook illustrations, spoken narration, and vocal cues, thereby providing children with concurrent linguistic and visual information rather than presenting graphemes in isolation. This cross-modal integration process creates additive, dual-coded memory traces that reinforce one another, supporting the formation of associations between auditory language, orthographic forms, and visual referents. Consistent with this interpretation, experimental evidence with preschool children shows that learning letter-sound mappings can transfer to the recognition of unfamiliar printed words, indicating that early grapheme-phoneme learning contributes to the development of broader word-recognition processes (Wang et al., 2022). Similarly, multisensory interactive instruction integrating visual and auditory information has been shown to support letter-sound correspondence learning among beginning bilingual readers (O'Brien et al., 2022). Taken together, these findings suggest that the combination of narrative language, visual representations, and explicit print-sound activities in the present intervention may have provided mutually reinforcing pathways for connecting phonological information with orthographic and semantic representations, thereby supporting the observed gains in grapheme-phoneme correspondence and word-picture association.

These empirical outcomes also provide a critical perspective on instructional approaches that present new words or orthographic forms without sufficient semantic and contextual support. In the baseline phase of the present study, children exhibited persistent difficulty connecting written words with corresponding picture cards despite previous exposure to flashcard-based instruction. Recent research suggests that preschool word learning is influenced by the richness and depth of semantic information available during learning, while multimodal storybook environments can provide additional representational support for encoding and retrieving newly encountered information (Bali et al., 2023; Bruner, 2024; Richtsmeier et al., 2024). In contrast to presenting lexical forms in isolation, the interactive storytelling intervention embedded target words within coherent narratives and paired printed words with storybook illustrations, spoken language, and guided interaction. Such contextualized and multimodal presentation may have enabled children to establish stronger connections among phonological forms, orthographic representations, and visual-semantic referents. Consistent with this interpretation, recent analysis of preschool storybook apps demonstrates that digital enhancements can be aligned with newly introduced vocabulary, providing additional representational cues that may support word learning (Bruner, 2024). Accordingly, the improvement in word-picture matching observed in Phase II may reflect the contribution of contextualized and multimodal learning experiences that transformed isolated word recognition tasks into meaningful opportunities for connecting linguistic forms with semantic and visual representations.

4.3. Dialogic Scaffolding and Socio-Cognitive Agency in Vocabulary Acquisition

The continuous progression in Contextual Vocabulary Acquisition, advancing from baseline ($M = 2.00$, $SD = 0.82$) to Phase I ($M = 2.62$, $SD = 0.96$) and culminating in Phase II ($M = 3.08$, $SD = 0.86$), provides empirical evidence of progressive vocabulary development following the interactive storytelling intervention. These quantitative gains were closely mirrored by qualitative field observations, which documented a marked transformation from passive listening to active linguistic participation. This developmental trajectory can be interpreted through socially mediated learning and instructional scaffolding, whereby children's language development is supported through responsive adult-child interaction. In the present intervention, strategic dialogic questioning, targeted vocal inflections, and open-ended prompts encouraged children to respond, elaborate, and construct meaning during story reading. Recent evidence indicates that open-ended and life-experience-based questions during shared-book reading increase preschool children's verbal responsiveness, while dialogic reading strategies are associated with greater extratextual talk and opportunities for vocabulary instruction (Olszewski & Hood, 2023; Wu et al., 2025). Complementary intervention evidence further demonstrates that content-rich shared reading can produce gains in both receptive and expressive vocabulary among preschool dual language learners, particularly on proximal measures of word learning (Gonzalez et al., 2024). Thus, the vocabulary gains observed in the present study may have resulted from the integration of narrative context, responsive questioning, and opportunities for children to actively articulate and elaborate word meanings.

Furthermore, qualitative observations revealed emerging self-correction strategies and greater vocal confidence during Phase II storytelling and word-matching tasks. When presented with tactile word-picture

cards, children increasingly moved beyond waiting for teacher validation and began to monitor their phonemic attempts, recognize mismatches, and adjust their responses during guided activities. This behavioral change is consistent with research identifying dialogic prompts, responsive comments, vocabulary-focused strategies, and paralinguistic supports as important components of interactive shared-book reading (Weadman et al., 2022). In the present intervention, repeated opportunities to respond, receive feedback, and revise answers may have encouraged children to assume greater responsibility for their own learning. Rather than relying exclusively on teacher correction, children increasingly monitored and modified their responses, suggesting an emerging form of learning-related self-regulation and communicative agency. Accordingly, the intervention may have contributed not only to vocabulary development but also to the development of active learner behaviors that support sustained engagement in early literacy activities (Dicataldo et al., 2022).

4.4. Pedagogical Implications for Classroom Practice and Early Childhood Policy

The empirical and qualitative outcomes of this study yield practical implications for early childhood educators seeking to translate emergent literacy theory into classroom practice. Specifically, the findings support a structured, three-stage interactive storytelling protocol that transforms shared reading into an active, multimodal learning experience. In the pre-reading phase, educators can activate children's prior knowledge and introduce target vocabulary through picture-book previewing. During reading, teachers can employ dialogic questioning, expressive vocal cues, and intentional grapheme–phoneme prompts to sustain engagement and connect oral language with print-related learning. In the post-reading phase, learning can be reinforced through hands-on word–picture matching and guided story retelling. This integrated approach is consistent with recent evidence indicating that interventions combining language-related and code-related skills can support emergent literacy development among preschool children (Cusiter et al., 2025). Evidence from shared-book reading further indicates that open-ended and experience-based teacher questions can increase preschool children's verbal responsiveness, highlighting the importance of responsive interaction in early literacy pedagogy (Wu et al., 2025).

Beyond classroom practice, these findings have implications for ECE curriculum development and teacher preparation. Rather than positioning vocabulary, oral language, phonological awareness, and print-related skills as isolated instructional targets, curricula can provide language-rich learning experiences in which these domains are addressed through meaningful social interaction. The present findings therefore support the incorporation of scaffolded interactive storytelling into ECE teacher preparation and classroom guidelines as a practical approach for integrating narrative engagement with explicit early literacy instruction. Such an approach may be particularly valuable in settings where early literacy instruction relies heavily on repetitive drills or decontextualized materials, although implementation should remain sensitive to children's developmental levels, teachers' professional capacity, available resources, and local curricular requirements.

4.5. Methodological Constraints and Future Research Agenda

While the findings of this study offer meaningful theoretical and practical insights, several methodological constraints should be acknowledged. First, the empirical evaluation involved only 13 preschoolers from a single early childhood center in West Java, Indonesia, which limits the generalizability and transferability of the findings to broader socio-demographic and educational contexts. Nevertheless, the small-sample design is consistent with the aims of practitioner inquiry and Design-Based Research (DBR), which emphasize iterative intervention, contextualized implementation, and close examination of learning processes within authentic classroom settings. In the present study, the limited cohort enabled detailed observation of individual learning trajectories, teacher–child interactions, and scaffolding processes that may be difficult to capture in larger-scale studies. Future research should therefore extend this initial evidence through larger multi-site samples and randomized or quasi-experimental designs involving children from diverse socioeconomic, linguistic, and educational backgrounds. Longitudinal studies are also needed to determine whether short-term gains in vocabulary and emergent literacy are retained over time and whether they contribute to subsequent reading development in elementary school. Finally, given the increasing integration of digital technologies into early childhood education, comparative research should examine whether physical storybooks and interactive digital storybooks produce differential effects on phonological awareness, attention, vocabulary learning, and semantic mapping.

5. CONCLUSION

This study demonstrates that a scaffolded interactive storytelling intervention drives a statistically significant, large-effect transformation in preschoolers' emergent literacy skills and early vocabulary acquisition. By transitioning from conventional, decontextualized flashcard drills to a multimodal narrative framework, young learners exhibited substantial, progressive gains across all three operationalized dimensions: grapheme-phoneme identification, word-picture association, and contextual word comprehension. The quantitative trajectory confirmed a highly significant performance shift from baseline to Phase II ($Z = -3.18$, $p < 0.001$), yielding a cumulative effect size ($r = 0.88$) that far exceeds standard

benchmarks for educational interventions. Qualitative classroom micro-interactions further validated these gains, revealing a fundamental behavioral shift from passive rote memorization toward active dialogic engagement, self-correction, and vocal confidence.

From a theoretical perspective, this research bridges a critical gap in early childhood literacy literature by illustrating the cognitive mechanisms through which narrative interventions operate. Grounded in Paivio's Dual Coding Theory and Vygotsky's Social Constructivism, the findings prove that integrating rich visual storybook imagery with structured dialogic questioning and hands-on orthographic matching exercises activates dual verbal and non-verbal processing channels. This concurrent verbal-visual encoding pathway facilitates effective orthographic mapping, enabling young children to connect abstract graphemes with phonological outputs and semantic meanings simultaneously. Consequently, interactive storytelling operates not merely as a passive listening activity, but as an essential socio-cognitive scaffolding tool that unifies "inside-out" decoding mechanics with "outside-in" linguistic comprehension.

Practically and politically, these outcomes advocate for a systematic reform in early childhood education curricula, urging a shift away from mechanical, repetitive drilling toward evidence-based, multimodal narrative instruction. Early childhood educators are encouraged to adopt structured three-tier reading protocols (pre-reading visual activation, during-reading dialogic prompting, and post-reading tactile consolidation) to maximize learning engagement. While this study's localized sample (N = 13) served as an ecologically valid practitioner inquiry, future research should expand this empirical foundation through multi-center Randomized Controlled Trials (RCTs), longitudinal investigations of vocabulary retention, and comparative analyses evaluating the efficacy of digital versus print interactive storybooks across diverse socio-demographic contexts.

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