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Developing Vocabulary Materials Through a Multisensory Approach for Preschoolers at TK Bangun Insan Mandiri

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ABSTRACT

This research and development study aimed to create and evaluate multisensory-based English vocabulary teaching materials for preschool learners aged 3-4 years at TK Bangun Insan Mandiri, Medan, Indonesia. Employing the ADDIE instructional design model (Analysis, Design, Development, Implementation, Evaluation), the study produced two complementary products: a Teacher's Guide Book and a Student Activity Book organized around five thematic units (Plants, Recreation, Occupation, Elements, Universe). Validation by material experts (92.5%), media experts (92.5%), and practitioner teachers (89.29%) confirmed the high feasibility of the products. Implementation with 14 preschoolers over five sessions using the Elements theme demonstrated significant vocabulary improvement, with pre-test scores averaging 37.86% (Belum Berkembang category) rising to 75.71% (Berkembang Sesuai Harapan category) in post-test assessments. Classroom observations revealed heightened student engagement, active participation, and enthusiasm during multisensory activities that incorporated visual, auditory, tactile, and kinesthetic elements. The findings confirm that systematically developed multisensory materials effectively support vocabulary acquisition in early childhood EFL contexts, addressing the gap between theoretical support for multisensory learning and its limited practical application in Indonesian preschool settings. This study contributes practical, validated resources for early English vocabulary instruction and demonstrates the efficacy of developmentally appropriate, sensory-rich pedagogical approaches for fostering young learners' language development.

Keywords: Multisensory Approach, Vocabulary Development, Preschool Education, Teaching Materials

I. INTRODUCTION

In the age of globalization, English has emerged as a universal language with extensive usage in technology, education, communication, and the workplace in India.Therefore, English is being taught in many nations, including Indonesia, starting at a young age, even in preschool. Teachers, curriculum designers, and legislators are increasingly concerned about early childhood English as a foreign language (EFL), particularly for preschoolers. According to Cameron (2001), this supports the idea that early exposure to a foreign language significantly improves language acquisition, particularly in terms of vocabulary. Vocabulary is one of the most fundamental aspects of language learning, forming the basis of comprehension, expression, and overall communication (Nunan, 1988).

Vocabulary is crucial for preschoolers because it provides building blocks for understanding and using language. A rich vocabulary allows children to interpret stories, follow instructions, and effectively express their basic needs. However, teaching vocabulary and speaking skills to preschoolers is challenging. Children in this developmental stage have varying learning styles, short attention spans, and developing motor and cognitive abilities. Traditional teaching methods that solely use lectures or memorization are typically less successful and unable to meet the developmental needs of young children (Pinter, 2006). Therefore, to encourage their learning, a more engaging, enjoyable, and developmentally appropriate approach is required (Slattery & Willis, 2001).

The multisensory approach works well for preschoolers' developmental needs. This method uses multiple senses visual, auditory, kinesthetic, and tactile all at once to aid in learning. According to multisensory learning theory, early childhood education research, and neuroscience findings, this approach is thought to improve learning effectiveness because children learn best when their multiple senses are engaged simultaneously (Sousa, 2015). When it comes to language learning, this method enables children to develop a natural and meaningful association between words and actions, objects, colors, singing, role-playing, storytelling, physical play, and the use of visual or manipulative aids and sounds.

According to Bredekamp and Copple (2009), the multisensory approach is also consistent with the principles of Developmentally Appropriate Practice (DAP), which emphasizes the significance of employing learning strategies that are suitable for each child's developmental stage and unique needs. Multisensory teaching materials contribute to children's social, emotional, and motor development, in addition to helping them meet cognitive objectives. For instance, when children learn the word "apple," they can grasp a real or toy apple (tactile), hear the word being spoken (auditory), see an image of an apple (visual), and move as though they are eating an apple (kinesthetics). This varied sensory engagement makes learning more efficient and pleasurable, reinforcing memory traces in the brain. Furthermore, multisensory learning aligns with Gardner's (1999) Multiple Intelligences Theory, which highlights the significance of teaching to accommodate children's various forms of intelligence.

However, in reality, many early childhood education classes continue to use traditional, text-based teaching techniques. Numerous studies (e.g., Rostan et al., 2021; Korkmaz & Karatepe, 2018) point to a recurring pattern in which teachers continue to emphasize writing and reading drills over actively involving students in sensory-rich vocabulary exercises. Furthermore, while some educators are aware of multisensory approaches, they lack the organized resources or instructions necessary to successfully apply them. As a result, learning environments may not fully engage children's cognitive and linguistic abilities.

Furthermore, there is still a glaring research gap in this area. While previous research has shown that multisensory approaches are effective in literacy-related domains, including alphabet recognition (Maliki & Yasin, 2017), reading open syllables (Rostan et al., 2021), and synthetic phonics (Abdul-Aal, 2023), few studies have explicitly addressed the methodical creation of multisensory-based materials designed to improve vocabulary abilities in preschool EFL contexts. Although there is substantial theoretical support for multisensory learning,

Despite the numerous advantages of this approach, multisensory learning is still not widely used in preschool instruction. Printed worksheets and memorization techniques, which are typically less interesting and do not fully engage children's senses, still make up a large portion of the teaching resources available. Teachers in many early childhood education institutions, particularly those in non-native English-speaking nations, frequently lack access to an organized multisensory curriculum. Consequently teachers are forced to produce their own materials without explicit instructions, leading to a lack of consistency in their efficacy and quality (Pinter, 2006; Shin & Crandall, 2014).

This highlights the urgent need to create multisensory English teaching resources, particularly for vocabulary and speaking instruction. In addition to helping children improve their speaking and vocabulary, these resources foster an enjoyable, engaging, and welcoming learning environment. The creation of such resources necessitates a thorough comprehension of early childhood cognitive, emotional, and sensory development, in addition to linguistic objectives. Thus, the purpose of this study is to create multimodal English teaching resources for young children,with an emphasis on speaking and vocabulary acquisition. This research is anticipated to close the gap in the creation of instructional materials and significantly enhance the standard of early English language instruction.

II. METHODS

A. *Research Design*

This study employed a Research and Development (R&D) design, which is appropriate for systematically developing and evaluating educational products that address specific learning needs. The R&D approach is particularly valuable in language teaching contexts where developmentally appropriate and locally relevant resources are often lacking (Tomlinson, 2011). This research utilized the ADDIE Model (Branch, 2009), a widely recognized instructional design framework comprising five stages: Analysis, Design, Development, Implementation, and Evaluation.

The Analysis stage involved identifying learner characteristics, curriculum gaps, and specific language acquisition requirements for preschoolers. This included classroom observations, teacher interviews, and curriculum analysis to determine discrepancies between current practices and desired outcomes. The Design stage translated the analysis findings into specific learning objectives, activity frameworks, and resource formats incorporating multisensory principles visual, auditory, tactile, and kinesthetic modalities—to accommodate young children's diverse learning profiles. The Development stage involved creating material prototypes, including printed materials, audio-visual resources, and tactile items, followed by expert validation to identify critical improvements. The Implementation stage involved classroom trials, where teachers applied materials in authentic teaching contexts, with researchers observing children's engagement and language use. Finally, the Evaluation stage encompassed both formative (during development) and summative (after use) assessments to guide product finalization and refinement.

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B. *Research Setting and Participants*

The study was conducted at TK Bangun Insan Mandiri, Medan Timur, Indonesia, during the 2025-2026 academic year. This institution was selected based on its existing English language education curriculum and willingness to adopt innovative teaching approaches, such as multisensory learning. The preschool setting was considered appropriate because of its play-based, supervised activities that provide an ideal context for observing language development in action.

Participants comprised three primary categories:

1. Preschool Students: Fourteen children aged 3-4 years, who were in Piaget's (1964) pre-operational stage of cognitive development. These children were developing essential linguistic, motor, and social-emotional skills, making them suitable subjects for assessing the Impact of multisensory instruction on vocabulary development. Purposive sampling was employed to ensure that the participants were actively enrolled in EFL courses and capable of participating in developmentally appropriate activities.
2. English Language Teachers: Classroom teachers are responsible for implementing the developed materials. They served as instructional facilitators and key informants, providing insights into the practicality, effectiveness, and child-friendliness of the materials. Teachers were selected based on their early childhood education backgrounds and willingness to participate in collaborative research.
3. Expert Validators: Curriculum developers, instructional materials experts, and early childhood education professionals who evaluated the quality of the materials based on predetermined criteria, including accuracy, relevance, developmental appropriateness, and alignment with learning objectives. Their professional judgment guided material revision, ensuring that the final output met both pedagogical standards and preschoolers' specific needs.

C. *Data Collection Techniques*

Multiple data collection methods were employed to ensure comprehensive and triangulated evidence for material development and evaluation.

Observation: Structured classroom observations using checklists assessed learner engagement, participation, attention span, verbal output, and multisensory responses to visual, auditory, tactile and kinesthetic stimuli. Observations were crucial for understanding how materials affected students in real time and identifying usability issues (Fraenkel & Wallen, 2009).

Interviews: Semi-structured interviews with teachers and expert validators explored the materials' usefulness, efficacy, and developmental appropriateness. The teacher interviews focused on implementation experiences, challenges encountered, and observed benefits. Expert interviews were centered on content relevance and pedagogical soundness. Semi-structured formats permitted a thorough investigation while maintaining participant consistency (Creswell & Creswell, 2018).

Questionnaires: Likert-scale questionnaires gathered systematic feedback from preschool teachers and expert validators, rating factors such as clarity, design, sensory integration, content accuracy, and developmental compatibility. The questionnaires were adapted from established educational material evaluation rubrics (Tomlinson, 2011), providing quantitative data on perceived quality and effectiveness.

Document Analysis: Supporting evidence was collected through teacher lesson logs, photographs, and videos during implementation, and samples of children's work (drawings and vocabulary sheets). These artifacts provide additional evidence of learning development, material effectiveness, and classroom context (Merriam & Tisdell, 2016).

D. *Research Instruments*

A range of instruments was developed for data collection, each carefully designed to align with the research objectives and participant characteristics.

Observation Checklist: Documented learner participation, responses, and behaviors during multisensory material use. The indicators included verbal participation, motor involvement, peer interaction, attention span, and enjoyment. The checklist featured Likert-scale evaluations and open-ended sections for anecdotal notes, adapted from early childhood engagement frameworks.

Interview Guidelines: Semi-structured protocols for English teachers and expert validators examined the materials' usefulness, comprehensibility, and developmental suitability. Open-ended questions explored implementation challenges, children's responses, and suggestions for improvement. Expert interviews were conducted to address instructional alignment, sensory integration, and material accuracy.

Validation Rubrics: Professional validators in early childhood education, curriculum design, or English language instruction evaluated products for age-appropriateness, visual and tactile quality, language accuracy,

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sensory balance, and content relevancy. A five-point Likert scale (1 = Very Poor, 5 = Excellent) was used, with space for feedback and revision suggestions provided.

Teacher and Validator Questionnaires: Distributed after the trial period to preschool teachers and professional validators, these included closed- and open-ended questions evaluating perceived utility, usability, and engagement level. Quantitative responses generated descriptive statistics, while qualitative responses were thematically analyzed.

Documentation Sheets: Collected supporting information, including children's drawings, vocabulary exercises, and photographs during classroom implementation, enabling a thorough analysis of student work and material interactions.

E. *Data Analysis Techniques*

Both qualitative and quantitative data were systematically analyzed to assess the viability, efficacy, and pedagogical value of the materials.

Qualitative Data Analysis: Thematic analysis was employed for the data from observations, interviews, and document analysis. Student behavior, researcher field notes, and expert/teacher comments were coded and categorized to identify recurrent themes, including learner engagement, material usability, teacher adaptation, and sensory stimulation (Braun & Clarke, 2006). The interview transcripts were coded and thematically analyzed to extract the teachers' perspectives on efficacy and classroom practicality.

Quantitative Data Analysis: Descriptive statistics were used to evaluate the validity, practicality, and effectiveness of the developed vocabulary teaching materials. The data sources included expert validation surveys, teacher responses, and student performance ratings. Purposive sampling (Sugiyono, 2015) was employed as nonprobability sampling was deemed appropriate for product development rather than population generalization. Likert-scale survey data were averaged, tallied, converted to percentages, and categorized using Sugiyono's (2017) interpretation criteria (e.g., "very valid," "valid," "less valid," "invalid"). Percentage formulas were used to assess practicality and efficacy.

Triangulation: Cross-referencing data from multiple sources (questionnaires, interviews, and observations) enhanced validity and minimized researcher bias. For instance, teacher remarks about student engagement were compared with student output and behavior. Triangulation confirmed data interpretation consistency and ensured taht materials were evaluated from expert, teacher, and student perspectives (Miles, Huberman, & Saldana, 2014).

III. RESULTS AND DISCUSSION

A. *Analysis Stage Findings*

Classroom observations and teacher interviews at TK Bangun Insan Mandiri revealed critical gaps between current practices and preschool learners' developmental needs.

Student Behavior Analysis: Observation data from the Nursery Avocado class (14 children, aged 3-4) indicated that while students could focus on teacher explanations (100%) and respond positively to visual (100%) and auditory (100%) materials, they showed no sustained interest (0%) or enjoyment of kinesthetic activities (0%). This discrepancy suggests that while students are accustomed to and find visual/auditory modalities useful, the complete absence of kinesthetic engagement reveals a critical gap between teaching practices and preschoolers' developmental needs for active, movement-oriented learning.

Learning Environment Analysis: Although availability of instructional media was adequate (100%), classroom design did not allow movement-based activities (0%) and did not support comprehensive multisensory learning (0%). This suggests that environmental and contextual factors, rather than resource availability, limit effectiveinstruction.

Teacher Instruction Analysis: Teachers effectively used visual aids (100%), songs/sounds (100%), and actively engaged students (100%), but entirely lacked kinesthetic teaching strategies (0%). This instructional imbalance indicates that teachers need structured, ready-to-use materials that specifically incorporate kinesthetic exercises.

Teacher Questionnaire Results: Responses from four teachers (Table 1) revealed a strong consensus on the need for multisensory materials, with 100% agreement that students need more visual materials, songs/audio input, movement activities, and multisensory materials. Teachers also reported teaching vocabulary as challenging (75%), students often lacking focus (75%), and needing time-efficient (100%) and ready-to-use thematic materials (75%).

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Table 1: Teacher Questionnaire Results

No	Statement	Agree/Strongly Agree	Percentage Agreement
1	Teaching English vocabulary is challenging	3 teachers	75%
2	Students are often less focused	3 teachers	75%
3	Current materials are not attractive	0 teachers	0%
4	Students need more visual materials	4 teachers	100%
5	Students enjoy songs and audio input	4 teachers	100%
6	Students need more movement activities	4 teachers	100%
7	The teacher needs multisensory materials	4 teachers	100%
8	The teacher needs ready-to-use thematic materials	3 teachers	75%
9	Teachers need time-efficient materials	4 teachers	100%
10	Classroom supports movement activities	4 teachers	100%
11	School provides sufficient basic tools	3 teachers	75%

Teacher Interview Findings: Semi-structured interviews confirmed that current vocabulary teaching uses flashcards and general approaches without structured multisensory integration. Teachers identified significant challenges, including low student ability, lack of motivation, and excessive vocabulary load at one time. Student responses were characterized as nervous, silent, and lacking confidence, with varied individual reactions to the same. Teachers expressed the need for thematic, adaptable materials facilitating audio, images, and interactive/touch-based activities, with simple language and varied strategies based on student needs.
Curriculum Analysis: Analysis of the national PAUD curriculum structure revealed strong theoretical support for multisensory, play-based, and learner-centered instruction through its emphasis on purposeful play, meaningful learning experiences, and integration of authentic/contextual materials. However, a significant gap exists between curriculum expectations and classroom practice, particularly regarding limited kinesthetic activities, despite adequate instructional time. This gap supports the need for structured multisensory English teaching materials that are developmentally appropriate, curriculum-aligned, and practical in preschool classrooms.

B. *Design Stage Outcomes*

Based on the needs analysis findings, the researcher designed multisensory English teaching materials to enhance vocabulary and speaking abilities for children aged 3-4 years. Two complementary products were produced: a Teacher's Guide Book and a Student Activity Book.
Teacher's Guide Book: This resource provides comprehensive guidance, including an introduction, characteristics of children aged 3-4, fundamentals of teaching English in early childhood education, multisensory approach explanations, learning objectives, classroom expressions, lesson plans, worksheet guidance, assessment rubrics, and recommendations for parents and teachers. The guide systematically facilitates multisensory education through pre-, during, and post-activity instructional stages.
Student Activity Book: The primary learning tool for children features colorful illustrations, simple instructions, and hands-on activities appropriate for 3-4-year-old developmental stages. Activities incorporate visual, auditory, tactile, and kinesthetic elements through coloring, tracing, pasting, movement-based tasks, and Total Physical Response (TPR) exercises.
Thematic Units: Content was organized into five thematic units: Plants (tree, flower, leaf, grass, fruit, and roots), Recreation (park, beach, swing, ball, zoo, and friends), Occupation (teacher, doctor, nurse, police,

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firefighter, and pilot), Elements (water, rain, river, air, and fire), and Universe (sun, moon, star, rainbow, sky, and cloud). Thematic learning aids vocabulary acquisition by connecting words to familiar contexts (Cameron, 2001).

C. *Development Stage Outcomes*

Product Creation: During the development stage, design blueprints were transformed into comprehensive teaching resources. Careful attention was paid to visual appeal through vibrant colors, eye-catching graphics, large visuals, and simple layouts to maintain the attention of young learners and promote engagement (Pinter, 2006). Multisensory learning principles were integrated throughout the course: visual elements (pictures and colors), auditory elements (songs and word repetition), tactile elements (coloring, tracing, pasting), and kinesthetic elements (movement-based tasks and TPR exercises).

Expert Validation Results: The Teacher's Guide Book and Student Activity Book were submitted to expert validators for quality assessment.

Material Expert Validation: Prof. Dr. Ahmad Laut Hasibuan, M.Pd., evaluated the products using a validation instrument with ten assessment indicators on a four-point Likert scale (1 = Not Appropriate, 4 = Very Appropriate). As shown in Table 2, the material expert scored 37 out of a maximum of 40, yielding a feasibility percentage of 92.5%, categorized as "Very Feasible" (Sangat Layak). The validator confirmed that the content was appropriate for preschoolers, effectively incorporated multisensory learning activities, and aligned with developmental characteristics.

Table 2: Material Expert Validation Results.

No	Assessment Indicators	Score
1	Learning Objectives	4
2	Age Appropriateness	4
3	Theme Appropriateness	3
4	Material Accuracy	4
5	Multisensory Approach	4
6	Instruction Clarity	4
7	Material Organization	4
8	Activity Relevance	3
9	Content Safety	3
10	Overall Feasibility	4
Total Score	37	
Percentage	92.5%	
Category	Very Feasible	

Media Expert Validation: Prof. Sutikno, S.Pd., M.Pd., Ph.D., evaluated the visual design, color choice, illustration quality, readability, layout organization, design consistency, image clarity, visual safety, media quality, and overall viability. The results (Table 3) showed a total score of 37 out of 40 (92.5%), categorized as "Very Feasible." The validator confirmed outstanding visual quality, appropriate use of vibrant graphics, legible typography, and child-friendly visual elements effectively supporting the learning objectives.

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Table 3: Media Expert Validation Results

No	Assessment Indicators	Score
1	Visual Design	4
2	Color Selection	3
3	Illustration Quality	4
4	Readability	4
5	Layout Organization	3
6	Design Consistency	4
7	Image Clarity	4
8	Visual Safety	4
9	Media Quality	3
10	Overall Feasibility	4
Total Score	37	
Percentage	92.5%	
Category	Very Feasible	

Teacher (Practitioner) Validation: The classroom teacher evaluated the usability, clarity of instructions, integration between the Teacher's Guide and Student Activity Book, and applicability for 3-4-year-olds. The results (Table 4) showed a total score of 25 out of 28 (89.29%), categorized as "Very Feasible." The teacher particularly valued the clarity of the Teacher's Notes and their value in directing class activities, confirming that the products were user-friendly and effectively supported classroom instruction.

Table 4: Teacher (Practitioner) Validation Results

No	Assessment Indicators	Score
1	Product instructions are easy for preschool teachers to understand	4
2	Student Activity Book is easy to use without complicated explanations	3
3	Teacher's Notes are presented clearly and concisely	4
4	Teacher's Notes help teachers implement learning activities	4
5	Teacher's Notes support the implementation of the multisensory approach	3
6	Integration between Teacher's Guide Book and Student Activity Book is clear	4
7	Product is easy to use in preschool classrooms for children aged 3-4 years	3
Total Score	25	

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No	Assessment Indicators	Score
Percentage	89.29%	
Category	Very Feasible	

Overall Validation: The average feasibility percentage across all validators was 91.43% (Table 5), confirming that the products met the criteria for high-quality educational materials and were ready for implementation following minor revisions.

Table 5: Overall Validation Results

No	Validator	Percentage	Category
1	Material Expert	92.5%	Very Feasible
2	Media Expert	92.5%	Very Feasible
3	Teacher (Practitioner)	89.29%	Very Feasible
Average	91.43%	Very Feasible	

Product Revision: Based on the validator's suggestions, several illustrations in the Student Activity Book were enlarged and repositioned for better visibility, layout consistency was improved, and minor proofreading was conducted. The revised products demonstrated improved visual clarity, better organization, and enhanced usability while maintaining the original instructional objectives and multisensory learning principles.

Implementation Stage Outcomes

Classroom Implementation: The developed products were implemented in a nursery class of 14 children aged 3-4 years over five learning sessions using the Elements theme (Water, Air, Fire). The researcher acted as a facilitator and observer, while the classroom teacher assisted in managing activities. Lessons incorporated visual (pictures, flashcards), auditory (songs, vocabulary repetition), tactile (coloring, tracing, matching), and kinesthetic (action songs, TPR, movement games) activities.

Pre-Test Results: Before implementation, a pre-test assessed children's initial vocabulary mastery using five indicators: recognizing target vocabulary, identifying pictures correctly, matching vocabulary with pictures/objects, understanding meaning, and classifying objects. The results (Table 6) showed a total score of 106, with an average of 7.57 (37.86%), categorized as Belum Berkembang (BB), indicating limited vocabulary knowledge related to the Elements theme.

Table 6: Pre-Test Results

Description	Score
Number of children	14
Total score	106
Average score	7.57
Percentage	37.86%
Category	BB (Belum Berkembang)

Post-Test Results: After five learning sessions, the post-test using identical indicators showed significant improvement (Table 7). The total score reached 212, with an average of 15.14 (75.71%), categorized as

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Berkembang Sesuai Harapan (BSH). Most children demonstrated improved vocabulary recognition, matching, and classification skills with greater confidence and enthusiasm during activities.

Table 7: Post-Test Results

Description	Score
Number of children	14
Total score	212
Average score	15.14
Percentage	75.71%
Category	BSH (Berkembang Sesuai Harapan)

Comparison of pre- and post-test eesults: As shown in Table 8 and Figure 1, significant improvements were observed across all measures. The total score increased by 106 points (from 106 to 212), the average score increased by 7.57 (from 7.57 to 15.14), and the percentage increased by 37.85% (from 37.86% to 75.71%). The overall category improved from Belum Berkembang to Berkembang Sesuai Harapan.

Table 8: Pre-Test and Post-Test Comparison

Assessment	Total Score	Average Score	Percentage	Category
Pre-Test	106	7.57	37.86%	BB
Post-Test	212	15.14	75.71%	BSH
Improvement	+106	+7.57	+37.85%	Increased

D. *Discussion*

This study successfully developed multisensory English teaching materials for preschoolers using the ADDIE instructional design model. The systematic development process, from needs analysis to evaluation, demonstrates the value of methodical instructional design in creating developmentally appropriate educational resources. The resulting Teacher's Guide Book and Student Activity Book represent practical, validated tools that address the gap between theoretical support for multisensory learning and its limited application in Indonesian preschools (Suhaila et al., 2025).

The thematic organization (Plants, Recreation, Occupation, Elements, Universe) reflects the principles of meaningful, contextualized language learning. By connecting vocabulary to familiar concepts and experiences, materials enable children to build semantic networks that facilitate comprehension and retention (Beck et al., 2013). This approach aligns with Purba et al. 's (2025) emphasis on theme-based, play-oriented instruction for young EFL learners (Purba et al., 2025).

The validation results (91.43% feasibility) confirmed that systematically developed materials can achieve high-quality standards while remaining accessible to classroom teachers. Expert validators' positive assessments indicated that the materials successfully balanced pedagogical soundness, developmental appropriateness, and visual appeal. Teacher validation (89.29%) particularly underscores the practical usability of the materials, addressing a common limitation in educational product development, where theoretically sound materials prove difficult to implement in authentic classroom settings (Fitra Ramadani et al., 2025).

Contribution of the Multisensory Approach to Vocabulary Learning

The significant vocabulary improvement demonstrated by pre-test to post-test gains (37.86% to 75.71%) provides compelling evidence for the effectiveness of multisensory instruction in early childhood EFL contexts. This finding aligns with theoretical frameworks emphasizing that the simultaneous engagement of multiple sensory pathways enhances learning effectiveness through reinforced neural connections and improved memory consolidation (Azizah et al., 2025).

Children's active participation and enthusiasm during implementation, as documented through classroom observations, support the assertion that multisensory learning piques curiosity, promotes enjoyment, and helps children feel comfortable in their learning environment. The integration of visual, auditory, tactile, and kinesthetic activities provides meaningful learning experiences that facilitated vocabulary retention and comprehension. This aligns with Silalahi's (2022) Multisensory Structured Language Education principles, demonstrating that systematic, explicit instruction incorporating varied sensory inputs benefits vocabulary acquisition (Silalahi, 2022).

These results corroborate previous research demonstrating the effectiveness of multisensory learning in early language learning. Similar to Korkmaz and Karatepe (2018), who found significantly higher reading achievement among Turkish early learners receiving multisensory instruction, the present study showed substantial vocabulary improvement. Similarly, Siregar et al. (2025) reported enhanced engagement and reduced confusion through multisensory techniques, consistent with the classroom observations in this study. The findings extend this research by specifically addressing vocabulary acquisition in Indonesian preschool EFL contexts, an area that has been previously underexplored (Siregar et al., 2025).

The affective benefits of multisensory instruction merit particular attention in this regard. Observations of increased confidence, reduced anxiety, and heightened motivation align with Krashen's (1982) Affective Filter Hypothesis, suggesting that multisensory activities create low-anxiety, high-motivation learning environments that are optimal for language acquisition. By connecting language learning to enjoyable and playful experiences, multisensory approaches help make English more accessible and memorable for young learners.

Suitability of Materials for Preschool Learners

The appropriateness of the materials for 3-4-year-old learners was confirmed through expert validation, teacher feedback, and classroom observations. This suitability reflects the careful attention paid to the developmental characteristics identified in the literature. At 3-4 years, children operate within Piaget's (1964) pre-operational stage, characterized by symbolic thinking, egocentrism, and reliance on concrete experiences. The materials' emphasis on visual representations, hands-on activities, and sensory engagement directly addresses these developmental needs (Gestwicki, 2016).

lignment with Vygotsky's (1978) sociocultural theory was evident in the implementation, where teacher guidance, peer interaction, and scaffolded activities facilitated language learning within children's Zone of Proximal Development. The Teacher's Guide Book provided structured guidance, enhancing the educational process and promoting meaningful classroom interactions, consistent with Shin and Crandall's (2014) emphasis on teacher scaffolding in early language instruction.

The materials also address Gardner's (1999) Multiple Intelligences theory by accommodating diverse learning styles. Visual, auditory, tactile, and kinesthetic activities engage linguistic, musical, bodily kinesthetic, and spatial intelligences, creating inclusive learning environments in which children with varied strengths can succeed. This flexibility is particularly important in early childhood education, where learning diversity is considerable (Bredekamp & Copple, 2009).

Effectiveness of Developed Materials in Improving Vocabulary Mastery

The substantial vocabulary improvement (37.85% increase) provides compelling evidence of the effectiveness of the developed materials. The post-test average of 75.71% (Berkembang Sesuai Harapan) indicates that after five learning sessions, the children demonstrated satisfactory vocabulary recognition, comprehension, and classification skills. This improvement supports Nation's (2001) assertion that vocabulary learning requires repeated exposure and meaningful interaction with target words, both of which are facilitated through multisensory activities.

The effectiveness is particularly notable considering the limited time (five sessions) and challenging context (EFL with minimal outside-classroom English exposure). This suggests that well-designed multisensory materials can substantially impact vocabulary development, even in resource-constrained environments. This finding aligns with Schmitt's (2000) emphasis on vocabulary knowledge as comprising both breadth and depth; through varied activities, children developed richer word knowledge than rote memorization alone would allow.

This improvement also reflects increased opportunities for productive vocabulary use. Children practiced vocabulary through songs, games, movement activities, and worksheets, which enabled active language production rather than passive recognition. This aligns with McCarthy and O'Dell's (2005) distinction between receptive and productive vocabulary, with materials designed to support both types of learning.

Implications of the Study

These findings have several implications for preschool English language instruction in China. First, educators should consider incorporating multisensory activities into vocabulary instruction, as such approaches promote engagement and provide meaningful learning experiences. Young learners benefit from learning environments that allow them to see, hear, touch, and move while acquiring new vocabulary. Second, educational institutions

should invest in developmentally appropriate instructional materials specifically designed for preschoolers, as well-designed resources help teachers deliver effective instructions and increase student engagement. Third, this study demonstrates the value of systematic instructional design in creating effective resource. Teacher educators and material developers can apply similar approaches when designing English materials for early childhood.

IV. CONCLUSIONS

This study successfully developed a reading comprehension module using the Herringbone Technique through systematic R&D processes, yielding a validated instructional product that meet Nieveen's (1999) quality criteria. Expert validation confirmed high validity (88.3%), establishing the module's theoretical soundness, curriculum alignment, and appropriate pedagogical design. Effectiveness testing demonstrated significant improvement in students' reading comprehension and critical thinking skills, with pre-test to post-test gains of 22.50 points, N-Gain of 0.72 (high category), and statistically significant paired t-test results ($t=14.83$, $p<0.05$), proving the module's efficacy in developing higher-order thinking within a brief implementation period. Student response questionnaires indicated highly positive perceptions (87.7%), confirming the product's practicality and affective engagement. Thus, the Herringbone Technique-based module offers a viable instructional resource for narrative text reading comprehension, operationalizing critical thinking development, and addressing a significant gap in strategy-based materials aligned with the Merdeka Curriculum's emphasis on higher-order thinking competencies. Recommendations include adoption by English teachers as a routine reading strategy, utilization by schools as supplementary teaching material, and replication by future researchers using quasi-experimental designs with control groups, longitudinal measurements, and broader contextual sampling to strengthen the generalizability of the findings.

Funding Statement

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Ethical Compliance

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Data Access Statement

A Data Access Statement is a section in a scientific publication or research report that explains how the data used or generated in the study can be accessed by the readers or other researchers. This statement aims to promote transparency, support research reproducibility, and comply with open-access policies, where applicable.

Common Elements in a Data Access Statement:

1. Data Location: Specifies where the data are stored, such as in online repositories (e.g., Zenodo, Dryad, or institutional repositories).
2. Access Instructions: Provides information on how to access the data, such as direct links, DOI (Digital Object Identifier), or contact details.
3. Data Availability: Indicates whether the data are publicly accessible, available upon request, or restricted due to ethical, legal, or privacy considerations.
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Examples of Data Access Statements:

1. Open Data:
   - "The data supporting this study are openly available in Zenodo at [DOI:10.xxxx/zenodo.xxxx]."
2. Restricted Data:
   - "The data that support the findings of this study are available upon request from the corresponding author. Due to privacy concerns, the data are not publicly available."
3. No Data Available:
   - "No datasets were generated or analyzed during the current study."
4. Conditional Access:
   - "The data supporting this study are available under restricted access and can be obtained upon reasonable request from the corresponding author and with the permission of the ethics committee."

Purpose of a Data Access Statement:

- Reproducibility: Enables other researchers to replicate or verify the findings.

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- Collaboration: Encourages further collaboration by sharing data.
- Compliance: Adheres to the policies of funding agencies or journals that require open access to data.

Conflict of Interest Declaration

The authors declare that they have no affiliations or involvement with any organization or entity with any financial interest in the subject matter or materials discussed in this manuscript.

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