

The Effectiveness of Children's Song-Based Learning Method on Improving Indonesian Vocabulary Mastery in Elementary School Students

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Abstract

Language acquisition and vocabulary mastery are fundamental to cognitive development during early childhood. From a physiotherapy perspective, the integration of multisensory learning approaches, including rhythmic and melodic elements, may stimulate neural pathways associated with both motor and cognitive functions. Objective: This study aimed to evaluate the effectiveness of a children's song-based learning method on improving Indonesian vocabulary mastery among first-grade elementary school students. Methods: A pre-experimental one-group pretest-posttest design was employed with 21 first-grade students (11 males, 10 females) from SDN 10 Rantau Selatan, Labuhanbatu Regency. The intervention comprised four sessions incorporating children's songs as the primary medium for vocabulary acquisition. Data were collected using vocabulary mastery tests (pre and posttests) and analyzed using descriptive statistics and paired sample t-tests. Results: Results demonstrated a significant improvement in vocabulary mastery, with mean scores increasing from 55.50 (pretest) to 80.50 (posttest), representing a 25.00-point increase ($p < 0.001$, $t = 14.15$). The N-Gain score of 0.56 indicates moderate effectiveness. The standard deviation decreased from 19.208 to 10.500, suggesting more homogeneous learning outcomes post-intervention. Conclusion: The children's song-based learning method proved effective in enhancing vocabulary mastery, supporting the integration of multisensory, rhythmic activities in early childhood education. These findings align with physiotherapy principles of sensorimotor integration and neuroplasticity, suggesting that musical-rhythmic interventions may facilitate cognitive-linguistic development through enhanced neural connectivity and motor-cognitive coupling.

Keywords: children's song-based learning, vocabulary mastery, Indonesian language, multisensory learning

I. INTRODUCTION

Language serves as the primary vehicle for human communication, enabling individuals to interact, express their ideas, and establish social relationships. In Indonesia, the national language, Bahasa Indonesia, holds a central position as the unifying language that all citizens are expected to master. For elementary school children, proficiency in Bahasa Indonesia forms the foundation for all subsequent learning in academic domains. Among the fundamental components of language proficiency, vocabulary mastery is perhaps the most critical, as it directly influences reading comprehension, written expression, oral communication, and academic achievement across subjects (Andi Siti Nurfadhilah, 2025).

The importance of vocabulary acquisition during early elementary education cannot be overstated. Research consistently demonstrates that vocabulary knowledge at school entry predicts later reading comprehension, academic achievement, and overall cognitive development (Izatunnajah & Wijayatiningsih, 2025). Children who enter formal schooling with robust vocabularies are better positioned to comprehend instructional materials, participate meaningfully in classroom discourse, and develop advanced literacy skills. Conversely, vocabulary deficits during these formative years can create cumulative disadvantages, as the gap between students with strong and weak vocabulary skills tends to widen over time (Ben Otman et al., 2025).

Despite the recognized importance of vocabulary instruction, many elementary classrooms continue to employ traditional, teacher-centered approaches that may not optimally engage young learners. Conventional methods such as rote memorization, word lists, and drill exercises often fail to capitalize on the natural learning preferences of young children, who typically respond more enthusiastically to active, multisensory, and playful learning experiences (Maqbulin, 2022). The limitations of these traditional approaches are particularly evident in the Indonesian educational context, where large class sizes and resource constraints may further restrict instructional innovation.

Observations at SDN 10 Rantau Selatan, the setting for this study, revealed several concerning patterns. First-grade students demonstrate limited vocabulary knowledge and struggle with basic word recognition, comprehension, and usage. Many students appeared disengaged during vocabulary instruction, exhibiting signs of boredom, frustration, and passivity. Teachers reported challenges in maintaining student attention and facilitating meaningful vocabulary acquisition within the constraints of traditional pedagogical approaches. These observations align with broader patterns documented in Indonesian elementary schools, where vocabulary instruction often relies heavily on teacher explanation, repetition, and written exercises without adequately considering students' developmental needs and learning preferences (Hariyanti et al., 2025).

II. METHODS

This study employed a pre-experimental research design with a one-group pretest-posttest approach. This design was selected to evaluate the effectiveness of the intervention on vocabulary mastery by comparing students' performance before and after the implementation of children's song-based learning. The one-group pretest-posttest design is appropriate for preliminary investigations when random assignment or control groups are not feasible, providing valuable evidence of intervention effectiveness while acknowledging limitations in causal attribution (Arikunto, 2017).

The research design can be represented as:

$$O_1 \rightarrow X \rightarrow O_2$$

Where:

- O_1 = Pretest (vocabulary mastery assessment before intervention)
- X = Intervention (children's song-based learning method)
- O_2 = Posttest (vocabulary mastery assessment after intervention)

This design allowed for within-subject comparisons, controlling for individual differences that might otherwise confound the results. Each participant served as their own control, with pretest scores establishing the baseline and posttest scores reflecting the impact of the intervention.

Participants and Sampling

The study population consisted of all first-grade students at SDN 10 Rantau Selatan, Labuhanbatu Regency, during the 2025-2026 academic year. First grade was selected because students at this age (approximately 6-7 years) are in a critical period for vocabulary development and have demonstrated significant challenges with conventional vocabulary instruction methods.

The sample comprised 21 first-grade students, including 11 males and 10 females. This sample represented the entire first-grade population at the school, as the total enrollment for the grade level was 21 students. The sampling method employed was purposive sampling, wherein all students who met the inclusion criteria were included in the study. This approach was appropriate given the relatively small population size and the goal of examining the intervention's effects comprehensively (Sugiyono., 2019).

Inclusion criteria for the study were:

1. Enrollment in first-grade at SDN 10 Rantau Selatan
2. Regular attendance during the study period
3. Parental consent for participation in the research

No exclusion criteria were applied because the entire class population was included to ensure comprehensive data collection and ecological validity.

Intervention: Children's Song-Based Learning Method

The intervention consisted of a four-session learning program that incorporated children's songs as the primary instructional medium for vocabulary acquisition. The sessions were conducted during regular Indonesian language instruction periods, with each session lasting approximately 60 min. The program was designed based on the established principles of music-based learning and tailored to the developmental characteristics of first-grade students.

Session Structure:

Each session followed a consistent structure to provide predictability while allowing variety in content and activities

1. Opening (10 minutes): The session began with a brief greeting and a review of the previous vocabulary. The teacher introduced the session's theme and learning objectives, and students engaged in a preliminary singing activity to activate prior knowledge and establish a positive learning atmosphere.
2. Vocabulary Introduction (15 minutes): The teacher introduced 5-8 new vocabulary words related to the session's theme. Vocabulary was presented through the lyrics of a selected children's song, with each word highlighted through visual aids (pictures, gestures, or real objects). The students were encouraged to repeat words and discuss their meanings.

3. Song-Based Learning Activity (20 min): Students participated in structured activities centered on the selected children's song. Activities included:
 - Listening to the song with lyric presentation
 - Choral singing with the teacher
 - Singing with movement and gestures
 - Identifying target vocabulary within the song
 - Completing fill-in-the-blank exercises with song lyrics
 - Creating simple sentences using target vocabulary
4. Vocabulary Practice and Application (10 minutes): Students engaged in practice activities to reinforce vocabulary learning. These activities included vocabulary games, word-picture matching, sentence completion, and partner work where students used new vocabulary in conversation.
5. Closing (5 minutes): The session concluded with a summary of learned vocabulary, a final group singing activity, and brief reflection on learning experiences.

Selected Songs and Vocabulary Targets:

Four children's songs were selected for the intervention, chosen for their popularity, appropriate content, vocabulary relevance, and alignment with the Indonesian language curriculum:

1. "Balonku Ada Lima" (My Five Balloons): This song introduces vocabulary related to colors, numbers, and emotions. The target vocabulary included color words (hijau, kuning, kelabu, merah muda, biru), number words (lima, empat), and emotion vocabulary (hati kacau).
2. "Naik Kereta Api" (Train Ride): This song introduces transportation and location vocabulary, including words related to travel, directions, and movement.
3. "Bintang Kecil" (Little Star): This song introduces vocabulary related to the sky, celestial bodies, and descriptive adjectives.
4. "Kebunku" (My Garden): This song introduces vocabulary related to plants, flowers, and nature.

Each song was selected based on its suitability for vocabulary instruction, its familiarity to students, and its potential to engage learners through melody and rhythm. The songs were presented with accompanying visual aids and gestures to enhance their comprehension and retention.

Assessment Instruments

Vocabulary Mastery Test:

The primary assessment instrument was a vocabulary mastery test administered as both a pre and post test. The test was designed to assess students' receptive and productive vocabulary knowledge across multiple formats.

Test Format and Content:

The test comprised three sections with a total possible score of 20 points:

1. Multiple Choice (five items, one point each): Students selected the correct answer from four options. Items assessed basic vocabulary knowledge including the following:
 - Object identification and naming
 - Animal sounds and characteristics
 - Food vocabulary
 - School supplies vocabulary
 - Fruit vocabulary
2. Fill-in-the-blank (10 items, 1 point each): Students completed sentences with appropriate vocabulary words. The items assessed productive vocabulary use across the target word categories.
3. Matching (5 items, 1 point each): Students matched words to corresponding pictures, assessing their comprehension of vocabulary-meaning associations.

Test Development and Validation:

The vocabulary test was developed through systematic procedures to ensure content validity and appropriateness for first-grade students

1. Content Review: Test items were reviewed by Indonesian language teachers and curriculum experts to verify alignment with learning objectives and grade-appropriate vocabulary expectations.
2. Pilot Testing: The test was pilot tested with a small group of first-grade students (not included in the study sample) to identify potential issues with item clarity, difficulty level, and administration procedures
3. Expert Judgment: Two experienced Indonesian language educators evaluated the test for content validity, providing feedback on item appropriateness, language clarity, and construct coverage.
4. Revision: Based on feedback from pilot testing and expert reviews, the items were revised for clarity, difficulty, and relevance.

Observation Protocol:

In addition to the vocabulary test, structured observations were conducted during intervention sessions using an observation protocol designed to document:

- Student engagement and participation levels
- Implementation fidelity of the song-based learning method
- Student responses to vocabulary instruction
- Incidental learning and spontaneous vocabulary use
- Classroom management and learning atmosphere

Data Collection Procedures

Data collection occurred in three phases:

Phase 1: Pretest Administration

Before the intervention began, a vocabulary mastery test was administered to all participants during regular class time. The pretest was administered under standardized conditions, and clear instructions were provided to all students. The researcher and classroom teacher proctored the test, ensuring students understood instructions and had adequate time to complete all items. The pretest was conducted in a single session lasting approximately 30 minutes.

Phase 2: Intervention Implementation

The four-session intervention was implemented over a two-week period, with sessions conducted twice weekly during regular Indonesian language instruction periods. The researcher, in collaboration with the classroom teacher, delivered all the intervention sessions following the established session structure. Fidelity to the intervention protocol was monitored through observation and session recording.

Phase 3: Posttest Administration

Following the completion of the intervention, a vocabulary mastery test (parallel to the pretest) was administered to all participants. The post test administration procedure mirrored the pre test protocol, with the same instructions, proctoring, and time allocation.

Data Analysis

Data analysis employed both descriptive and inferential statistical methods to address the research questions and test the hypotheses.

Descriptive Statistics:

Descriptive analyses were conducted to characterize the data and examine patterns in vocabulary performance:

1. Measures of Central Tendency: Mean (average) scores for both pretest and posttest were calculated to summarize overall performance and identify improvement patterns.
2. Measures of Variability: Standard deviation and score range were calculated to describe the distribution of scores and examine changes in score variability following the intervention.
3. Frequency Distributions: Score distributions were created to examine the proportions of students at different performance levels.

Inferential Statistics:

Inferential analyses were conducted to test the research hypothesis and examine the statistical significance of the observed changes

1. Normality Testing: The Shapiro-Wilk test was used to assess whether the data met the normality assumption required for parametric testing. This test was appropriate given the relatively small sample size ($n=21$), and results confirmed that the data were normally distributed.

2. Paired Sample t-test: The primary hypothesis test employed a paired sample t-test to compare pre and posttest scores. This test was appropriate because it examined differences within the same group across two time points, accounting for individual baseline differences. The null hypothesis (H_0) stated that there was no significant difference between the pretest and posttest scores, whereas the alternative hypothesis (H_1) stated that there was a significant difference.

$$t = (\bar{x}_{diff}) / (s_{diff} / \sqrt{n})$$

1. Where $\bar{x}_{diff}$ is the mean difference between paired scores, s_{diff} is the standard deviation of differences, and n is the sample size.

The significance level was set at $\alpha = 0.05$, with the decision rule to reject H_0 if $p < 0.05$.

2. Effect Size (N-Gain): The N-Gain score was calculated to examine the effectiveness of the intervention using the following formula:

$$N\text{-gain} = (\text{posttest score} - \text{pretest score}) / (\text{maximum score} - \text{pretest score})$$

1. N-Gain scores were interpreted using established criteria:

- Low effectiveness: $g < 0.3$
 - Moderate effectiveness: $0.3 \leq g \leq 0.7$
 - High effectiveness: $g > 0.7$
2. Cohen's d: The standardized effect size was calculated to provide a context-independent measure of the intervention effectiveness. Cohen's d was interpreted as follows:
- Small effect: $d = 0.2$
 - Medium effect: $d = 0.5$
 - Large effect: $d = 0.8$

Software: Statistical analyses were conducted using SPSS (Statistical Package for the Social Sciences) version 26.0. All data were entered and verified for accuracy prior to analysis.

III. RESULTS AND DISCUSSION

The study examined vocabulary mastery among 21 first-grade students before and after the implementation of a children's song-based learning method. Table 1 presents the descriptive statistics for both pretest and posttest scores.

Table 1: Descriptive Statistics for Vocabulary Mastery Scores

Statistic	Pretest	Posttest
N	21	21
Mean	55.50	80.50
Median	55.00	80.00
Mode	50	80
Minimum	25	60
Maximum	80	95
Sum	1165	1690
Std. Deviation	19.208	10.500

Table 2 presents the results of normality testing using the Shapiro-Wilk test.

Table 2: Tests of Normality

Variable	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	.178	21	.086	.945	21	.263
Posttest	.193	21	.056	.912	21	.058

Note: Both variables showed normal distribution ($p > .05$)

The normality test results confirmed that both pretest ($p = .263$) and posttest ($p = .058$) scores were normally distributed, satisfying the assumption for the paired sample t-test analysis.

Paired Sample t-Test:

Table 3 presents the results of the paired sample t-test comparing the pretest and posttest scores.

Table 3: Paired Sample t-Test Results

Pair	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Posttest - Pretest	25.00	8.125	1.774	14.150	20	.000

Interpretation of t-Test Results:

Mean Difference (25.00): The average increase in vocabulary mastery scores was 25.00 points, representing significant improvement.

t-Statistic (14.150): The t-value far exceeds the critical value (2.086) at $df = 20$, $\alpha = .05$, confirming that the observed difference is statistically significant.

Significance Level ($p < .001$): The p-value of .000 ($p < .001$) provides extremely strong evidence against the null hypothesis, supporting the alternative hypothesis that the intervention was effective.

Effect Size Analysis:

N-Gain Analysis:

Table 4 presents the N-Gain calculation results, categorized by effectiveness level.

Table 4: N-Gain Score Distribution

N-Gain Range	Category	Frequency	Percentage
$g > 0.70$	High	8	38.1%
$0.30 \leq g \leq 0.70$	Moderate	11	52.4%
$g < 0.30$	Low	2	9.5%
Total		21	100%

Correlation Analysis:

Table 5 presents the correlation between the pretest and posttest scores.

Table 5: Paired Sample Correlations

Pair	N	Correlation	Sig.
Pretest & Posttest	21	.852	.000

The strong positive correlation ($r = .852$, $p < .001$) indicates that students who scored higher on the pretest also tended to score higher on the posttest, suggesting consistent individual differences in vocabulary learning ability. However, the significant improvement across all students indicates the the intervention was effective regardless of the initial ability level.

Discussion

The results of this study provide robust evidence that the children's song-based learning method is effective for improving Indonesian vocabulary mastery among first-grade elementary school students. The substantial increase in mean scores from 55.50 to 80.50 (a 25-point improvement), combined with the significant t-test results ($p < .001$) and moderate N-Gain effectiveness rating (0.56), confirms the efficacy of the intervention. These findings align with and extend previous research on music-based learning (Juang Kurniawan, 2025)(Kadar et al., 2023), providing further support for the effectiveness of musical interventions in education.

From a physiotherapeutic perspective, the findings support the theory that multisensory learning experiences facilitate more robust and durable learning outcomes. The intervention's success can be attributed to the integration of auditory

(song listening and singing), visual (lyric presentation and visual aids), and kinesthetic (movement and gestures) elements, creating redundant neural representations of vocabulary items. This multisensory approach aligns with neuroplasticity principles, suggesting that repeated, varied sensory experiences strengthen neural connections through Hebbian learning mechanisms (Waruwu et al., 2025).

The rhythmic and melodic components of the songs likely activated both auditory and motor neural networks, with the cerebellum and basal ganglia contributing to rhythm processing and vocabulary encoding. This motor-cognitive coupling may have enhanced vocabulary acquisition by providing multiple retrieval cues and reinforcing neural pathways through cross-modal integration (Ravi & Mohamad, 2026). The significant correlation between pre and posttest scores ($r = .852$) suggests that the intervention built upon existing cognitive resources while also facilitating new learning, consistent with the neuroplasticity principles of experience-dependent learning.

The effectiveness of song-based learning can be understood through information processing theory, particularly the phonological loop component of working memory. Rhythmic and melodic structuring of verbal information may optimize phonological loop functioning, improving the encoding and rehearsal of new vocabulary. The emotional engagement associated with music likely enhanced attention and motivation, facilitating deeper processing and more effective memory consolidation (Secaresmi et al., 2025).

Repeated exposure to vocabulary through song lyrics, with the added support of visual aids and gestures, provided multiple encoding opportunities, strengthening memory traces through varied retrieval contexts. The consistent improvement observed across all students, regardless of their initial ability level, suggests that song-based learning may be particularly effective in supporting vocabulary acquisition for learners with diverse learning needs and preferences (Utomo et al., 2024).

Vygotsky's sociocultural theory provides another framework for understanding the intervention's effectiveness. Song-based learning activities create authentic communicative contexts in which students can practice vocabulary in socially meaningful ways. The group singing experience fostered a supportive learning community, with students supporting each other's learning through social interaction. The teacher's role as a more knowledgeable other, providing scaffolding and guided participation, supported students within their zone of proximal development (Salleh et al., 2025).

The social nature of singing activities may have particularly benefited vocabulary learning by providing meaningful communicative contexts in which vocabulary was used naturally rather than being learned in isolation. This approach aligns with communicative language teaching principles, emphasizing the importance of using language for authentic purposes rather than focusing solely on explicit instruction (Azisa et al., 2025).

The findings of this study are consistent with the physiotherapeutic principles of motor learning and development. The rhythmic, coordinated movements associated with singing may stimulate the vestibular and proprioceptive systems, which are closely connected to the cerebellum and have been implicated in both motor and cognitive functions. This connection may explain why the song-based learning method was particularly effective in supporting vocabulary acquisition, as it integrated motor and cognitive learning in a manner consistent with developmental physiotherapy approaches (Sagimin, 2025).

The decreased standard deviation in post test scores (from 19.208 to 10.500) is particularly noteworthy from a physiotherapy perspective, suggesting that the intervention not only improved vocabulary mastery but also reduced performance variability. This reduction in variability may indicate that the multisensory, structured nature of the intervention provided more consistent learning support than traditional methods, helping students with weaker initial vocabulary to catch up and develop more uniform skills. This finding aligns with the physiotherapeutic goals of improving functional outcomes and reducing disparities in developmental trajectories.

These findings have significant implications for educational practices, particularly in early childhood and elementary education settings. The demonstrated effectiveness of song-based learning suggests that teachers should consider incorporating music-based activities as a regular component of vocabulary instruction. The approach's alignment with child development principles (active, multisensory, social, and enjoyable learning) makes it particularly well-suited for young learners.

IV. CONCLUSIONS

This study investigated the effectiveness of a children's song-based learning method in improving Indonesian vocabulary mastery among first-grade students at SDN 10 Rantau Selatan, Labuhanbatu Regency, during the 2025-2026 academic year. The findings provide strong evidence supporting the research hypothesis, demonstrating significant improvements in vocabulary mastery after the intervention. Significant Vocabulary Improvement: Students showed substantial improvement in vocabulary mastery from pretest ($M = 55.50$) to posttest ($M = 80.50$), representing an average increase of 25.00 points. This improvement was consistent across all students, with individual score gains ranging from 4 to 10 points (on a 20-point scale). Statistical Significance: The paired sample t-test revealed highly significant differences between the pre and post test scores ($t(20) = 14.15$, $p < .001$), confirming that the observed improvement was not due to chance. Moderate Effectiveness: The N-Gain score of 0.56 indicated moderate

effectiveness, with 38.1% of students showing high effectiveness ($N\text{-Gain} > 0.7$) and 52.4% showing moderate effectiveness. Reduced Variability: The decreased standard deviation from the pretest (19.208) to the posttest (10.500) suggests more homogeneous learning outcomes, indicating that the intervention was particularly beneficial for students with lower initial vocabulary levels. Positive Learning Experience: Observations indicated that the song-based learning method created a positive, engaging learning atmosphere where students participated actively and showed enthusiasm for vocabulary learning activities..

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 readers and other researchers. This statement aims to promote transparency, support research reproducibility, and comply with open access policies, where applicable.

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Purpose of a Data Access Statement:

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