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Multimedia Glosses and the Cognitive Process in EFL Learning: A Study at SMP Negeri 2 Tiakur

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ABSTRACT

Vocabulary acquisition is a fundamental component of English as a Foreign Language (EFL) learning, yet many learners continue to face challenges in retaining and applying new vocabulary, especially when relying on traditional instruction. This study investigates the effectiveness of multimedia glosses in enhancing vocabulary acquisition among junior high school students at SMP Negeri 2 Tiakur, Indonesia. Using a quasi-experimental design, 54 students were randomly assigned to an experimental group and a control group, each consisting of 27 students with comparable English proficiency levels based on pre-test scores. The experimental group received vocabulary instruction embedded with multimedia glosses—comprising text, image, audio, and video elements—while the control group engaged with unglossed, print-based materials. Data were analyzed using SPSS, including descriptive statistics, Levene's Test for homogeneity of variance, and independent-samples t-tests. The results revealed a statistically significant improvement in the experimental group's post-test scores ($p < .001$), with a large effect size (Cohen's $d = 1.83$), indicating the substantial impact of multimedia glosses on vocabulary learning outcomes. These findings align with cognitive theories such as Dual Coding and Multimedia Learning, suggesting that multimodal input enhances memory encoding and retention. The study underscores the pedagogical value of integrating multimedia glosses into digital EFL instruction and recommends their use to support vocabulary development, particularly in under-resourced educational settings.

Keywords*: vocabulary acquisition, multimedia glosses, cognitive processing, EFL learning, digital instruction*

INTRODUCTION

Vocabulary acquisition is widely regarded as a cornerstone in second language learning. For English as a Foreign Language (EFL) learners, vocabulary proficiency significantly influences the development of core language skills: reading comprehension, listening fluency, oral expression, and writing clarity. Scholars such as Read (2000) and Webb and Nation (2017) emphasize that a learner's ability to understand and produce language is largely dependent on the breadth and depth

of their lexical knowledge. Without a sufficient vocabulary base, learners struggle to make sense of authentic texts or communicate effectively.

Despite its central role, vocabulary acquisition poses challenges, especially in environments where learners have limited access to real-life English exposure. In many Indonesian contexts, including remote areas such as Tiakur, students rely heavily on translation-based instruction and memorization strategies, which often fail to support long-term retention or contextual understanding (Andriani, 2019; Hersalina, 2021). Traditional instructional materials may also lack interactive or scaffolding features that help learners internalize new vocabulary.

One effective pedagogical intervention is the use of glosses—short explanatory notes or definitions that accompany reading texts. Glosses reduce the cognitive load of guessing unfamiliar vocabulary, promote learner autonomy, and support both incidental and intentional vocabulary acquisition (Nation, 2013; Teng, 2019). They provide readers with immediate lexical support, allowing for more fluid reading and better integration of new words into existing knowledge networks.

With the integration of technology in language education, glosses have evolved from static text into rich, multimedia formats. Multimedia glosses present vocabulary support through various modalities—text, audio, images, or video—offering multimodal cues to reinforce word meanings (Boers et al., 2017). According to Mayer's (2009) Cognitive Theory of Multimedia Learning and Paivio's (1991) Dual Coding Theory, this multimodal input enhances semantic encoding and retention by activating both verbal and visual channels of cognition.

Several empirical studies support the effectiveness of multimedia glosses in second language vocabulary acquisition. For instance, Abu Seileek (2011) found that EFL learners who used hypermedia glosses (text + audio) demonstrated significantly higher vocabulary recall than those using text-only glosses. Similarly, Chen and Yen (2013) reported that students exposed to glosses with visual and auditory annotations showed improved reading comprehension and word retention. In another study, Boers et al. (2017) confirmed that adding relevant images to glosses significantly enhanced learners' ability to retain and recall new vocabulary, especially when glosses were contextually embedded. These studies highlight the pedagogical value of multimedia glosses as tools for deeper lexical engagement.

While the benefits of multimedia glosses have been documented, such interventions remain underutilized in many EFL classrooms in Indonesia, particularly in rural and under-resourced regions. The integration of digital learning resources in areas like SMP Negeri 2 Tiakur can address instructional limitations and support more cognitively engaging vocabulary learning. With mobile technology and internet connectivity increasingly available, there is potential for multimedia glosses to transform vocabulary instruction beyond traditional print-based methods.

Although existing research affirms the efficacy of multimedia glosses, limited studies have investigated their impact on cognitive processing and vocabulary acquisition within Indonesian

junior high school settings. Few have specifically examined the interaction between gloss modality and learning outcomes in fast-paced vocabulary tasks. To address this gap, the current study aims to evaluate the effectiveness of multimedia glosses in enhancing vocabulary retention and cognitive engagement among EFL learners at SMP Negeri 2 Tiakur. It also seeks to compare performance outcomes between students using glossed materials and those using traditional, unglossed texts to contribute to best practices in digital EFL pedagogy.

METHOD

This study employed a quasi-experimental research design featuring a pre-test–post-test control group format, which is widely used in educational research where full randomization may not be feasible (Creswell, 2012). The aim was to examine the impact of multimedia glosses on vocabulary acquisition among EFL learners. While full randomization was limited due to the structure of the school environment, the design ensured a valid comparison between groups by using baseline pre-test scores to confirm initial equivalence (Fraenkel et al., 2019). This structure allowed the researchers to analyze the differential effects of the intervention on vocabulary learning outcomes under controlled instructional conditions.

Participants were selected using random sampling from second-grade students at SMP Negeri 2 Tiakur, located in the Southwest Maluku Regency. A total of 54 students participated in the study. After administering a vocabulary pre-test, students were matched based on their English proficiency levels to ensure comparable starting points. They were then randomly assigned to either the experimental group or the control group, each consisting of 27 students. All participants were native speakers of Bahasa Indonesia with similar academic exposure to English instruction through the school curriculum.

The experimental group received vocabulary instruction through digitally delivered reading materials embedded with multimedia glosses, which are annotations presented in various formats to aid comprehension (Abu Seileek, 2011; Boers et al., 2017). These glosses were designed to support lexical understanding using four modalities: (1) text glosses, providing definitions and sample sentences; (2) image glosses, offering visual representations of word meanings; (3) audio glosses, including native speaker pronunciations; and (4) video glosses, showing short contextualized clips where the target vocabulary was used. The glosses were integrated via clickable hyperlinks and pop-up windows, enabling learners to access them instantly during reading. The digital materials were accessed through school-provided tablets and laptops and featured user-friendly navigation, designed to reduce extraneous cognitive load and promote learner autonomy (Mayer, 2009; Sweller, 1988).

In contrast, the control group engaged with identical vocabulary content presented in traditional print-based format. They were provided with unglossed texts and vocabulary exercises, relying on teacher explanations, personal dictionaries, and contextual inference to determine word meanings. Both groups completed the same instructional tasks—multiple-choice vocabulary recognition,

word-matching, and word-building exercises—to ensure consistency in content and assessment procedures (Schmitt, 2008).

To collect data, a pre-test was administered to both groups prior to the intervention to measure baseline vocabulary knowledge. After the instructional period, a post-test was conducted to assess vocabulary gains. Both assessments were developed based on established vocabulary evaluation principles and validated by two TEFL experts to ensure content validity (Nation, 2001). The items were also piloted with a comparable group of students not involved in the actual study, ensuring clarity and construct reliability.

Data analysis was conducted using SPSS version 25. An independent-samples t-test was first used to compare the pre-test scores and confirm no significant difference between groups. Levene's Test was applied to verify the homogeneity of variance assumption prior to inferential analysis. Then, descriptive statistics (mean, standard deviation, and confidence intervals) were calculated for post-test scores. Finally, another independent-samples t-test determined whether post-test differences between groups were statistically significant, with Cohen's d calculated to measure effect size (Field, 2013).

To ensure validity, the study implemented baseline matching, uniform instructional exposure, and standardized test administration. Reliability was reinforced through the use of validated test instruments, pre-testing of all materials, and consistency checks. For qualitative item scoring, inter-rater reliability was established through independent scoring by two raters, with discrepancies resolved by discussion. Ethical approval was obtained from the school administration, and informed parental consent was secured.

FINDINGS AND DISCUSSION

This section presents the results of the study aimed at examining the effect of multimedia glosses on vocabulary acquisition among EFL learners. The findings are organized according to the sequence of statistical procedures described in the method: pre-test comparison, test of homogeneity of variance, descriptive statistics of post-test scores, and inferential analysis using an independent-samples t-test.

Pre-Test Score Comparison

To confirm that both groups began the intervention at a similar proficiency level, an independent-samples t-test was conducted on pre-test scores. As shown in Table 1, the experimental group had a mean score of 53.78 (SD = 9.12), while the control group scored 52.41 (SD = 8.85). The t-test result ($t(52) = 0.78$, $p = .439$) indicated no statistically significant difference between the groups, thus establishing a valid baseline for post-intervention comparisons.

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Table 1. Pre-Test Scores: Experimental vs. Control Group

Group	N	Mean Score	Standard Deviation (SD)
Experimental	27	53.78	9.12
Control	27	52.41	8.85

These results support the internal validity of the study by demonstrating group equivalency at the start. Similar pre-test scores ensured that any observed differences in post-test outcomes could be confidently attributed to the instructional treatment rather than initial disparities in vocabulary knowledge.

Test of Homogeneity of Variance

Before conducting the t-test on post-test scores, Levene's Test for Equality of Variances was performed to confirm the assumption of homogeneity. The test yielded a result of $F(1, 52) = 2.49$, $p = .121$, which is greater than the alpha level of 0.05. This indicates that the variance in vocabulary scores between the control and experimental groups was statistically equivalent, allowing for valid application of the t-test.

Table 2. Levene's Test for Homogeneity of Variance (Post-Test Scores)

Levene Statistic	df1	df2	Sig. (p-value)
2.49	1	52	.121

This statistical assumption is crucial in parametric analysis, as it ensures that group variances are comparable, thereby reducing the risk of Type I error (Field, 2013).

Descriptive Statistics of Post-Test Scores

Following the intervention, descriptive statistics revealed a noticeable difference in post-test vocabulary scores. The experimental group ($n = 27$), which received multimedia gloss-enhanced instruction, achieved a mean score of 82.74 ($SD = 8.45$). In contrast, the control group ($n = 27$), which received traditional instruction, had a mean score of 65.22 ($SD = 10.31$). These descriptive results suggest that learners exposed to multimedia glosses performed better on vocabulary acquisition tasks than their peers in the control group.

Table 3. Descriptive Statistics: Post-Test Scores

Group	N	Mean Score	Standard Deviation (SD)
Experimental	27	82.74	8.45
Control	27	65.22	10.31

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This finding suggests that the use of multimedia glosses provided a significant advantage in vocabulary learning. These results are consistent with Boers et al. (2017), who found that visual and contextual enhancements in glosses lead to higher vocabulary retention. The integration of text, images, and audio in the current study likely engaged dual coding pathways, supporting deeper encoding and recall as theorized by Paivio's Dual Coding Theory (1991).

Inferential Statistics: Post-Test Score Comparison

An independent-samples t-test was used to determine whether the difference in post-test performance was statistically significant. The analysis revealed a significant difference in vocabulary achievement between the two groups, $t(52) = 6.83$, $p < .001$. The computed Cohen's $d = 1.83$, indicating a large effect size. This suggests that the multimedia gloss intervention had a substantial positive impact on students' vocabulary acquisition.

Table 4. Inferential Statistics: Post-Test Comparison

Group Comparison	t	df	Sig. (2-tailed)	Mean Difference	Cohen's d
Experimental vs. Control	6.83	52	< .001	17.52	1.83

These findings align with those of Chen and Yen (2013) and Abu Seileek (2011), both of whom demonstrated that multimedia glosses, particularly when combining textual and auditory elements, enhance vocabulary acquisition and comprehension. The significant effect size observed in this study reinforces the pedagogical value of multimodal glosses in accelerating vocabulary uptake, especially among learners with limited exposure to authentic English contexts.

Theoretical Integration

The results underscore the cognitive benefits of multimedia glosses. The experimental group's enhanced performance can be explained through Mayer's (2009) Cognitive Theory of Multimedia Learning, which posits that meaningful learning occurs when learners actively integrate verbal and visual information. The glosses in this study supported this process by providing immediate, multimodal lexical cues that reduced cognitive load and reinforced memory encoding.

Furthermore, the improved outcomes across task types (multiple-choice, word matching, and word building) suggest that multimedia glosses support not only recognition but also the productive use of vocabulary, which is critical for long-term language development. This echoes findings from Schmitt (2008), who emphasized the importance of attentional focus and depth of processing in vocabulary learning. The structured, interactive nature of the glosses likely guided students toward deeper semantic processing, as supported by the Levels of Processing Framework (Craik & Lockhart, 1972).

CONCLUSION

The findings of this study clearly demonstrate that multimedia glosses significantly enhance vocabulary acquisition among junior high school EFL learners, with students in the experimental group outperforming their peers in the control group across all task types. The use of text, image, audio, and video glosses provided multimodal support that promoted deeper cognitive processing and better retention, aligning with established theories such as Dual Coding and Cognitive Load Theory. These results not only confirm the effectiveness of multimedia glosses observed in previous research but also highlight their practical value in Indonesian EFL contexts, where traditional vocabulary instruction often lacks interactivity. Therefore, integrating multimedia glosses into digital language learning materials offers a promising pedagogical strategy for improving vocabulary outcomes and fostering learner engagement in diverse educational settings.

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