

Effects of Visual Aid–Based Instruction with Pictograms to Enhance EFL Students' Vocabulary Learning

Ana Quinonez-Beltran¹, Carmen Benitez-Correa¹, Elsa Morocho-Cuenca¹

¹ Universidad Técnica Particular de Loja, Ecuador

Correspondence: Ana Quinonez-Beltran, Universidad Técnica Particular de Loja, Ecuador.

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Abstract

Visual aid-based instruction has been proposed to support vocabulary learning by pairing verbal input with visuals that facilitate comprehension, retention, and engagement. Among visual aids, pictograms may be particularly useful for linking images to lexical items, thereby making vocabulary learning more accessible for young learners. In this context, the present study examined the effects of pictogram-based instruction on upper primary students' EFL vocabulary learning in public schools, explored potential gender differences in vocabulary gains, and investigated students' perceptions of this instructional strategy. The study included 257 sixth-grade students (aged 10-11 years), distributed into a control group (n = 124; 61 females and 63 males) and an experimental group (n = 133; 69 females and 64 males). The experimental group received vocabulary instruction supported by pictogram-based strategies, whereas the control group continued with conventional teaching strategies. A quasi-experimental mixed-methods design was implemented over a five-month period using pre- and post-tests, a perceptions questionnaire, and semi-structured interviews. Descriptive statistics and assumption testing were reported before inferential analyses. The results showed a significant Group x Time interaction, indicating that vocabulary improvement was greater in the experimental group. Gender-based analyses indicated that the intervention benefited both females and males, with relatively larger gains among females in the experimental group. In addition, students reported highly positive perceptions of pictogram-based instruction, indicating that it supported learning, increased confidence, and made vocabulary study more enjoyable. These findings suggest that pictogram-based instruction is a practical and pedagogically valuable strategy for enhancing vocabulary development in upper-primary EFL contexts.

Keywords: EFL instruction, pictograms, visual aids, vocabulary

1. Introduction

Vocabulary is widely recognized as a foundation stone of learning, as it provides the building blocks necessary for communication, comprehension, and academic achievement (Robiya et al., 2024). Without adequate lexical repertoire, students often struggle to express ideas, understand texts, and participate in meaningful interactions (Nation, 2013). In language teaching contexts, vocabulary instruction is therefore a priority, yet traditional methods based on rote memorization and translation may limit learners' engagement and retention (Schmitt & Schmitt, 2020). To address this challenge, researchers and educators have increasingly explored the use of innovative instructional strategies that foster active, meaningful, and multimodal vocabulary learning.

One of those innovative strategies is visual aid-based instruction, which has been proposed as a way to support vocabulary learning by transforming abstract concepts into concrete and memorable visual representations. However, visual aid-based instruction is not a single uniform strategy, as it may involve different resources, including pictures, flashcards, videos, infographics, and symbolic visual tools such as pictograms. Therefore, previous findings on visual aids in general should not be assumed to apply equally to all types of visual support, learner groups, or EFL contexts. When pedagogically integrated rather than used as decorative materials, these resources may support learners' comprehension, retention, and motivation in EFL classrooms (Haq & Madany, 2025; Wiyati & Marlina, 2021). By linking words with images, visual scaffolds may help learners establish stronger semantic associations and contextualize vocabulary, making it easier to retrieve during communication (Ahangari et al., 2015).

Among the different types of visual aids, pictograms stand out as a particularly effective resource for supporting vocabulary learning. A pictogram is a deliberately designed graphic symbol that conveys meaning without relying on words, transcending language barriers and performing essential functions such as guiding, permitting, warning, and prohibiting (Adir et al., 2017). Unlike complex images or detailed illustrations, pictograms convey meaning through minimalistic design, making them universally accessible regardless of learners' linguistic background (Vargas, 2021). In EFL settings, pictograms can serve as visual cues to reinforce vocabulary instruction, reduce ambiguity, and facilitate faster word recognition. Their symbolic nature also allows learners to develop associations between visual forms and lexical items, supporting both immediate comprehension and long-term retention (Bates, 2017).

The pedagogical effectiveness of pictograms can be understood through learning theories that emphasize the role of visual and cognitive processes in knowledge acquisition. Paivio's Dual Coding Theory (2014) explains that information encoded through both verbal and

visual channels is more likely to be retained and recalled, making pictograms a powerful resource to complement textual input. Similarly, Cognitive Load Theory (Sweller, 2011) suggests that visual supports such as pictograms reduce extraneous cognitive demands, allowing learners to focus on essential information and process vocabulary more efficiently. Building on these principles, Mayer's Multimedia Learning Theory (2020) highlights that learners are benefited when information is presented in both verbal and visual modes, as long as the design avoids redundancy and cognitive overload. Taken together, these theories provide a solid foundation for integrating pictograms into EFL vocabulary instruction, as they explain how visual stimuli enhance memory, attention, and comprehension.

Existing research highlights the potential of pictograms to enhance vocabulary learning in EFL contexts, but it also shows that their effectiveness depends on learners' age, proficiency level, task design, and the way visual resources are integrated into instruction. In this regard, Adeniyi et al. (2022) and Pauzhi and Argudo-Serrano (2023) found that pictograms, combined with simplified language and visual supports, improved vocabulary retention, comprehension, and learner motivation, although teachers reported challenges in selecting and integrating visuals effectively. Similarly, López Calero (2021) demonstrated that incorporating pictograms into classroom sessions facilitated the learning and application of new vocabulary. Vargas (2021) revealed that pictogram-based resources increased students' motivation and fluency in expressing ideas. More recently, Pico Lozano et al. (2025) provided quasi-experimental evidence with Spanish-speaking children, showing that pictograms boosted vocabulary retention and improved reading motivation. These findings justify further research because the effectiveness of pictogram-based instruction still needs to be examined in specific EFL contexts, age groups, and learner profiles.

Despite growing empirical evidence supporting the benefits of pictogram-based instruction, important gaps remain in the literature. Most studies have focused on early primary learners or teachers' perspectives, leaving upper primary EFL students comparatively underexamined. This omission is significant, as learners at this stage face increasing lexical and academic demands and are expected to use vocabulary more productively in reading and oral communication. Investigating pictogram-based instruction with this age group is therefore both pedagogically and developmentally justified.

In addition, limited research has examined whether the effects of pictogram-based instruction vary by gender. Exploring potential differences allows for a more nuanced understanding of how visual supports function across diverse learner profiles and can inform more equitable instructional practices. Furthermore, while vocabulary gains are commonly measured through achievement tests, students' perceptions of pictogram-supported learning remain underexplored. Because learner attitudes influence motivation and engagement, incorporating perceptual data provides a more comprehensive evaluation of instructional effectiveness.

In view of these considerations, the present study aimed to examine the effects associated with using pictograms as part of the visual-aid instruction in supporting vocabulary learning by answering the following research questions:

RQ1: How does pictogram-based instruction impact vocabulary learning among upper primary EFL students?

RQ2: To what extent do the effects of pictogram-based instruction on EFL students' vocabulary learning differ by gender?

RQ3: What are students' perceptions of using pictograms to learn vocabulary in EFL classrooms?

2. Literature Review

2.1 Vocabulary Learning in EFL

Vocabulary knowledge is widely recognized as a fundamental component of effective communication and a keystone of foreign language learning. Learners with limited lexical resources face significant difficulties in understanding spoken and written input and in expressing ideas accurately, which directly constrains communicative competence (Hidayat & Syahrizal, 2020; Katemba, 2021).

Research has consistently emphasized that vocabulary development underlies learners' abilities across the four language skills: listening, speaking, reading, and writing by strengthening comprehension and production processes (Bai, 2018; Manetta, 2018). Beyond linguistic performance, lexical knowledge enables learners to articulate meanings, thoughts, and emotions more effectively, reinforcing its centrality in foreign language education.

Nevertheless, vocabulary learning is not an automatic outcome of exposure. In EFL contexts, where meaningful input is often limited, incidental learning alone has proven insufficient. Instead, empirical research highlights the importance of structured instructional approaches that combine explicit teaching, contextualized practice, and active engagement with lexical items to promote durable learning (Nation, 2013; Schmitt & Schmitt, 2020; Webb & Nation, 2017). These findings emphasize the need for pedagogical strategies that support deeper lexical processing and long-term retention.

2.2 Visual Aid-Based Instruction for Vocabulary Learning in EFL

Traditional vocabulary instruction grounded primarily in translation and rote memorization has been criticized for its limited effectiveness in fostering meaningful learning and long-term retention (Oxford, 2011; Schmitt & Schmitt, 2020). Consequently, researchers have increasingly advocated for multimodal and learner-centered approaches that enhance engagement and promote deeper cognitive processing (Pateşan et al., 2018; Wiyati & Marlina, 2021).

In alignment with these approaches, visual aids have emerged as one of the most effective multimodal strategies for vocabulary instruction in EFL settings. By transforming abstract lexical items into concrete visual representations, visual aids facilitate comprehension, support meaning construction, and strengthen recall (Almurashi, 2016; Bouknify & Anasse, 2024). Common visual

resources include pictures, flashcards, diagrams, infographics, and videos, which help learners establish semantic associations between words and their referents (Qasserras, 2024; Wiyati & Marlina, 2021).

The pedagogical value of visual aids is strongly supported by cognitive learning theories. Dual Coding Theory proposes that information processed through both verbal and visual channels is more likely to be retained and retrieved (Paivio, 2006), while Multimedia Learning Theory suggests that meaningful integration of pictorial and verbal input reduces cognitive load and enhances learning efficiency (Mayer, 2020). Empirical studies grounded in these frameworks demonstrate that visual support improves vocabulary retention and recall by linking linguistic and non-linguistic representations (Haq & Madany, 2025; Sadoski, 2005).

In addition to cognitive benefits, visual aids positively influence affective dimensions of learning. Their use has been associated with increased motivation, attention, and learner confidence, contributing to more engaging and inclusive classroom environments (Qasserras, 2024; Wiyati & Marlina, 2021). Visualized instruction also supports differentiated learning by accommodating diverse proficiency levels and learning preferences, particularly benefiting learners with limited exposure to English or learning difficulties (Ahangari et al., 2015; Bouknify & Anasse, 2024).

Although the effectiveness of visual aids for vocabulary learning is important, some studies (Alqahtani, 2015; Bouknify & Anasse, 2024) have conceptualized visual aids as a broad category. Consequently, it is relevant to focus on the use of pictograms as part of visual aids and how it may differentially influence vocabulary learning outcomes.

2.3 Pictograms in EFL Vocabulary Learning

Within the broader category of visual aids, pictograms represent a distinct and increasingly relevant instructional resource. Pictograms are simplified visual signs that convey meaning through figurative symbols representing objects, actions, or ideas (Pauzhi & Argudo-Serrano, 2023; Wang et al., 2022). By compressing meaning into minimal visual forms, pictograms enable learners to connect abstract lexical concepts with tangible representations (Neves et al., 2022; Sansone, 2015).

Despite their apparent universality, pictogram interpretation may vary across cultural contexts, highlighting the importance of user-centered design to ensure clarity and accessibility (Neves et al., 2022). When appropriately designed, pictograms can be understood quickly and intuitively. They reduce cognitive effort and strengthen memory links, which helps learners retain and learn new vocabulary. In addition, working with pictograms can foster learners' skills in interpretation and abstraction, supporting their ability to make meaning from visual information in a more confident way (Nezhyva et al., 2022).

In this line, pictograms function as mediators between visual and verbal information. They help overcome linguistic barriers, particularly for learners with limited language proficiency, and foster positive attitudes toward learning by increasing engagement and attention (Pauzhi & Argudo-Serrano, 2023). However, research also acknowledges limitations, as pictograms may be less effective for conveying idiomatic or highly abstract vocabulary. Consequently, they should be integrated as complementary resources within broader instructional methodologies rather than used in isolation (Schmitt & Schmitt, 2020; Webb & Webb, 2020).

2.4 Gender as a Factor in EFL Vocabulary Learning

Gender has long been examined as a variable in second and foreign language learning research, particularly in relation to vocabulary acquisition, learning strategies, and affective factors. Early studies suggest that female learners often outperform male learners in vocabulary-related tasks (Chen & Liu, 2025), a tendency attributed to greater use of cognitive and metacognitive strategies, stronger verbal memory, and more positive attitudes toward language learning (Bouirane, 2015; Isa et al., 2022; Sunderland, 2000).

However, subsequent research has challenged the consistency of these differences. When instructional conditions, learning opportunities, and assessment contexts are controlled, gender-based differences in vocabulary learning outcomes tend to diminish or disappear (Ellis, 2015; Hyde, 2005). These findings suggest that observed differences may be more closely related to pedagogical and contextual factors than gender itself.

In the context of visual and multimodal instruction, evidence regarding gender-related effects remains limited and inconclusive. Although visual aids are known to facilitate vocabulary learning through dual coding and integrated verbal-visual processing (Mayer, 2009; Paivio, 2006), relatively few studies have examined whether such instructional approaches differentially benefit learners according to gender. This gap is particularly notable given the increasing use of visual and multimodal resources in EFL classrooms.

Understanding whether pictogram-based instruction affects male and female learners differently is therefore essential for informing inclusive pedagogical practices and for determining whether observed vocabulary gains can be attributed to instructional design rather than learner characteristics. Addressing gender as a moderating variable responds directly to calls for more nuanced analyses of learner differences in EFL research.

3. Method

3.1 Participants

The study initially included 257 upper primary students (aged 10–11 years) enrolled in sixth grade of public schools in Ecuador. Participants were native Spanish speakers, and their English proficiency level was classified as A1 according to the Common European Framework of Reference for Languages (CEFR). They attended three 40-minute English classes per week, in accordance with the guidelines of the Ecuadorian Ministry of Education.

Students were assigned to two intact groups: a control group ($n = 124$; 61 females and 63 males) and an experimental group ($n = 133$; 69 females and 64 males). The groups were comparable in demographic characteristics (e.g., age) and initial English proficiency. The experimental group received vocabulary instruction through pictogram-based strategies explicitly integrated into vocabulary lessons, whereas the control group continued with conventional teaching strategies. The sample was selected through convenience sampling, a non-probability technique based on accessibility and willingness to participate (Mertler, 2019). All 257 cases were retained for analysis after data cleaning, which involved checking numeric entries and converting values stored as text into numeric scores.

3.2 Research Design

This study adopted a mixed-methods approach combining quantitative and qualitative data. Integrating both approaches strengthened the study through methodological triangulation and provided a richer understanding of the phenomenon under investigation (Kawar et al., 2024). In addition, a quasi-experimental design with intact groups was employed, which is appropriate in educational settings where random assignment is often not feasible (Creswell & Creswell, 2017). This design enabled the comparison of vocabulary learning outcomes between groups and the examination of the effects of pictogram-based instruction on EFL learners' lexical development.

3.3 Instruments

The study employed a pre-test and a post-test administered to both the control and experimental groups to establish learners' baseline vocabulary knowledge prior to the intervention and to examine vocabulary learning outcomes following the intervention period. To support robust pre-post comparisons, the two instruments were constructed as parallel forms: the post-test replicated the pre-test in format, sectioning, and number of items, thereby enhancing measurement equivalence and minimizing potential threats to internal validity associated with test-form differences.

Both tests included 15 items distributed across two sections. Section 1 comprised 10 objective items (matching, classification, and multiple-choice), targeting recognition and controlled recall of the target vocabulary. Section 2 consisted of five productive items requiring learners to write short sentences using the same vocabulary in context. This two-part structure balanced receptive and productive vocabulary knowledge and reflected a progression from lower- to higher-order cognitive demands based on an adapted Bloom's taxonomy framework.

Target lexical items were selected based on three criteria. First, the words were drawn from the Ecuadorian English curriculum to ensure alignment with instructional content and the participants' expected proficiency level. Second, the items were organized according to the course units (Cultural Diversity, World Celebrations, Language through the Arts, and Solving the Mystery of Likes and Dislikes) to reflect the instructional sequence and lexical scope of the intervention. Third, the tests were aligned with learning objectives adapted from Bloom's revised taxonomy, progressing from recognition and recall tasks (e.g., matching images to words) to application tasks (e.g., writing short sentences using the target vocabulary).

Scoring procedures were standardized across administrations. In line with the Ministry of Education's assessment standards, the total test score was set at 10 points. The 10 objective items were scored dichotomously (1 = correct, 0 = incorrect) and weighted to yield a maximum objective score of 7 points (i.e., 0.7 points per item). The five productive items were scored using a criterion-referenced scheme assessing accuracy of vocabulary use, grammatical appropriateness, and spelling, for a maximum productive score of 3 points. The same scoring criteria and rater guidance were applied at both testing points to ensure consistency.

To strengthen content validity, the instruments were reviewed by four EFL specialists with expertise in EFL instruction, who evaluated item relevance, clarity, and alignment with the study objectives. Recommended revisions were incorporated prior to implementation. In addition, a pilot administration with 10 students and five EFL teachers was conducted to refine item wording, confirm timing feasibility, and improve item functioning. Reliability was estimated using Cronbach's alpha ($\alpha = .80$), indicating acceptable internal consistency for research purposes.

In addition, a perceptions questionnaire was administered exclusively to the experimental group immediately after the intervention to capture students' views of pictogram-based instruction. The instrument comprised 11 statements adapted from Yowaboot and Sukying (2022) and used a five-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree). The questionnaire was administered in Spanish. For reporting purposes, the instrument and illustrative evidence were translated into English during manuscript preparation. Content validity was examined using the Index of Item-Objective Congruence (IOC) method. Internal consistency reliability was assessed with Cronbach's alpha, which exceeded .75, indicating satisfactory reliability for research purposes.

To complement and triangulate the survey findings, a semi-structured interview was conducted face-to-face with a randomly selected subgroup of students from the experimental group ($n = 17$). Interviews lasted approximately 15 minutes and were audio-recorded with participants' consent. The interview protocol included eight open-ended questions that elicited brief yes/no positions followed by explanations or justifications, enabling deeper insight into students' experiences and perceptions of the pictogram-based instruction strategy. Interview data were analyzed using reflexive thematic analysis (Braun & Clarke, 2021). The process involved familiarization with the recordings, generation of initial codes, identification of recurring patterns, development and revision of themes, and selection of representative evidence. To strengthen analytic rigor, the coding process combined deductive sensitizing concepts derived from the questionnaire constructs with inductive theme development from students' explanations, and analytic decisions were documented throughout the process. In addition, the coding structure and the final themes were reviewed by two EFL specialists to check the clarity of

the codes, their correspondence with students' responses, and the coherence of the themes. Differences in interpretation were discussed until agreement was reached. Since the qualitative component followed reflexive thematic analysis rather than a quantitative content-analysis scale, Cronbach's alpha was used only to assess the internal consistency of the quantitative instruments.

3.4 Procedure

The study was conducted over a five-month period and implemented in four stages. In Stage 1, students in the experimental group were informed about the pictogram-based intervention and its pedagogical purpose in supporting vocabulary learning. In Stage 2 (diagnostic phase), both groups completed a pre-test to determine their initial level of EFL vocabulary knowledge.

In Stage 3 (instructional implementation), participants attended on-site English classes. Each 40-minute class followed a three-phase didactic sequence: anticipatory set, main teaching input, and assessment. Within these phases, students completed vocabulary-learning activities aligned with the Ministry of Education topics: Cultural Diversity, World Celebrations, Language through the Arts, and Solving the Mystery of Likes and Dislikes. The control group was taught through conventional strategies, whereas the experimental group learned vocabulary through pictogram-based instruction using pictograms designed in Canva. Pictograms were not used merely as supplementary visual aids; rather, they constituted the core of an instructional strategy systematically integrated into the lesson sequence. Students in the experimental group engaged in tasks such as matching words with pictorial representations, classifying images into semantic categories, and producing simple sentences with pictograms. They also participated in memory games, picture-based dialogues, and collaborative activities involving the interpretation and description of pictograms. These activities were designed to promote active participation, foster visual association, and enhance vocabulary retention, while also encouraging interaction, communication, and motivation. Below are representative samples of the pictograms used in this study.



Figure 1. Sample Pictograms Used in the EFL Vocabulary Learning Intervention

Note. The figures present sample pictograms used in the intervention to support EFL vocabulary learning by linking lexical items from the topics studied with visual representations.

Stage 4 focused on evaluation. Both groups completed a post-test to measure vocabulary learning outcomes after the intervention. Additionally, students in the experimental group completed a perceptions questionnaire to assess their views on learning vocabulary through pictogram-based instruction. To complement these data, a semi-structured interview was conducted with a randomly selected subgroup of experimental participants. The interview included eight open-ended questions exploring students' perceptions, experiences, and challenges when using pictograms. Interview responses were analyzed using reflexive thematic analysis (Braun & Clarke, 2021), moving recursively from data familiarization and coding to theme development and refinement. This qualitative component strengthened triangulation and enriched the interpretation of students' perceptions.

Finally, quantitative data from the pre-test and post-test were analyzed using IBM SPSS Statistics v25. Descriptive statistics were first calculated to summarize students' vocabulary performance across groups and testing times. Before conducting inferential analyses, the assumptions of normality and homogeneity of variance were examined using the Shapiro-Wilk test and Levene's test, respectively. Based on these assumption checks, a two-way mixed-design ANOVA was used as the primary analysis for RQ1, with Time (pre-test vs. post-test) as the within-subject factor and Group (control vs. experimental) as the between-subject factor. For RQ2, vocabulary gain scores were summarized descriptively by Group and Gender and then analyzed using a two-way factorial ANOVA. When unequal variances were detected in follow-up comparisons, Welch-adjusted tests were used. The perceptions questionnaire was analyzed descriptively using frequencies and percentages. Statistical significance was set at $\alpha = .05$, and effect sizes were reported using partial eta squared for ANOVA effects and Cohen's d for mean differences.

4. Results

4.1 How Does Pictogram-Based Instruction Impact Vocabulary Learning among Upper Primary EFL Students?

Before inferential analysis, descriptive statistics were computed to show the overall achievement patterns across groups and testing times. As shown in Table 1, both groups improved from pre-test to post-test, but the experimental group showed a larger mean gain than the control group.

Table 1. Descriptive Statistics for Vocabulary Performance by Group

Group	n	Pre-test M	Pre-test SD	Pre-test range	Post-test M	Post-test SD	Post-test range	Gain M	Gain SD	Gain range
Control	124	6.85	1.40	4.0-10.0	7.50	1.44	4.5-10.0	0.65	0.41	0.0-2.0
Experimental	133	6.59	1.65	0.0-10.0	8.28	1.24	5.0-10.0	1.69	1.03	-0.8-5.4

Note. Scores were measured on a 0-10 scale. Gain = post-test minus pre-test.

Assumption testing was then conducted to justify the inferential procedures. Shapiro-Wilk tests were statistically significant for the pre-test, post-test, and gain scores, indicating that the normality assumption was not fully met. Levene's tests showed homogeneous variances for pre-test and post-test scores, which supported the use of the mixed-design ANOVA for RQ1. Levene's test for gain scores was significant; therefore, Welch-adjusted comparisons were used for the follow-up analyses in RQ2.

Table 2. Assumption Testing for Quantitative Analyses

Analysis component	Test	Result	Interpretation
Control pre-test	Shapiro-Wilk	W = 0.971, p = .009	Normality not fully met
Control post-test	Shapiro-Wilk	W = 0.961, p = .001	Normality not fully met
Control gain score	Shapiro-Wilk	W = 0.863, p < .001	Normality not fully met
Experimental pre-test	Shapiro-Wilk	W = 0.974, p = .013	Normality not fully met
Experimental post-test	Shapiro-Wilk	W = 0.955, p < .001	Normality not fully met
Experimental gain score	Shapiro-Wilk	W = 0.933, p < .001	Normality not fully met
Pre-test scores by group	Levene's test	F = 3.49, p = .063	Homogeneity met
Post-test scores by group	Levene's test	F = 2.56, p = .111	Homogeneity met
Gain scores by Group × Gender	Levene's test	F = 29.66, p < .001	Unequal variances

Note. Shapiro-Wilk tests were used to assess normality, and Levene's tests were used to assess homogeneity of variance.

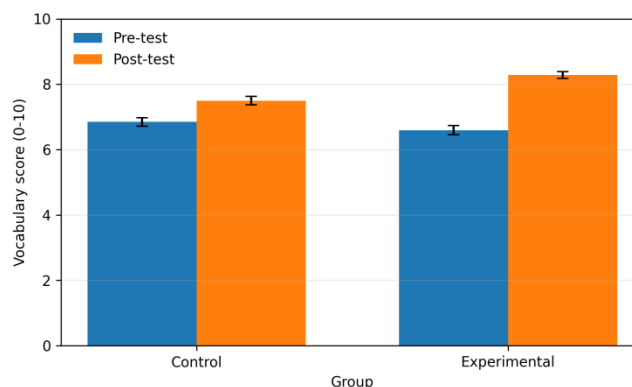


Figure 2. Pre- and Post-test Performance by Group

Note. Mean vocabulary test scores for control and experimental groups across pre- and post-tests. Error bars represent standard errors of the mean.

The two-way mixed-design ANOVA showed a significant Group × Time interaction, $F(1, 255) = 109.46$, $p < .001$, partial eta squared = 0.300. This indicates that the experimental group improved more than the control group from pre-test to post-test. Specifically, the experimental group gained 1.69 points on average, whereas the control group gained 0.65 points. The difference in gains represented a large effect, Cohen's $d = 1.31$, suggesting that pictogram-based instruction contributed to greater vocabulary improvement than conventional instruction.

Table 3. Mixed-design ANOVA Results for Vocabulary Scores

Effect	df1	df2	F	p	Partial eta squared
Time	1	255	571.62	< .001	0.692
Group	1	255	2.39	.123	0.009
Group x Time	1	255	109.46	< .001	0.300

Note. The Group x Time interaction was the primary test of the intervention effect.

4.2 To What Extent Do the Effects of Pictogram-Based Instruction on EFL Students' Vocabulary Learning Differ by Gender?

For RQ2, descriptive statistics were first examined by Group and Gender. Table 4 shows that gains were small and similar for females and males in the control group. In the experimental group, both genders improved, but females showed larger gains than males. Females in the

experimental group started with lower pre-test scores but reached post-test scores close to those of males, which is important for interpreting the gender pattern cautiously.

Table 4. Descriptive Statistics for Vocabulary Performance by Group and Gender

Group	Gender	n	Pre-test M	Pre-test SD	Post-test M	Post-test SD	Gain M	Gain SD	Gain range
Control	Female	61	6.92	1.48	7.52	1.50	0.61	0.43	0.0-1.5
Control	Male	63	6.78	1.34	7.47	1.40	0.69	0.40	0.0-2.0
Experimental	Female	69	6.29	1.61	8.26	1.07	1.97	1.24	-0.8-5.4
Experimental	Male	64	6.92	1.65	8.31	1.40	1.39	0.63	0.0-2.5

Note. Scores were measured on a 0-10 scale. Gender coding in the dataset was 1 = male and 2 = female.

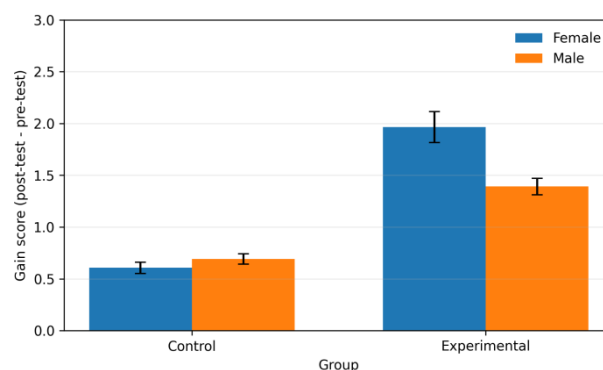


Figure 3. Vocabulary Gains by Gender and Group

Note. Gain scores were calculated as post-test minus pre-test. Error bars represent standard errors of the mean.

The two-way ANOVA on gain scores revealed a significant main effect of Group, $F(1, 253) = 115.05$, $p < .001$, partial eta squared = 0.313, showing that the experimental group achieved larger gains than the control group. The main effect of Gender was also significant, $F(1, 253) = 7.12$, $p = .008$, partial eta squared = 0.027. More importantly, the Group x Gender interaction was significant, $F(1, 253) = 11.70$, $p < .001$, partial eta squared = 0.044, indicating that the effect of the instructional condition on vocabulary gains differed by gender. Because Levene's test indicated unequal gain-score variances across the Group x Gender cells, $F(3, 253) = 29.66$, $p < .001$, the simple effects were interpreted using Welch-adjusted comparisons.

Table 5. Simple-effect Comparisons for Vocabulary Gain Scores

Comparison	Mean 1	Mean 2	t	df	p	Cohen's d
Control: Female vs. Male	0.61	0.69	-1.13	120.45	.260	-0.20
Experimental: Female vs. Male	1.97	1.39	3.41	102.14	< .001	0.58
Female: Experimental vs. Control	1.97	0.61	8.53	85.84	< .001	1.43
Male: Experimental vs. Control	1.39	0.69	7.54	106.63	< .001	1.33

Note. Welch-adjusted tests were used for simple effects because gain-score variances were unequal across cells. Positive d values indicate larger gains for the first group named in each comparison.

The simple-effect analyses showed that gains did not differ significantly between females and males in the control group. In the experimental group, both females and males improved, but females showed significantly larger gains than males. Nevertheless, because females in the experimental group began with lower pre-test scores, the larger gain should be interpreted as a conditional pattern linked to initial performance and the instructional context, rather than as evidence of a fixed gender advantage.

4.3 What are students' perceptions of Using Pictogram-Based Instruction to Learn Vocabulary in EFL Classrooms?

Students' perceptions were examined through the post-intervention questionnaire and then complemented with interview data.

Table 6. Students' Perceptions of Using Pictogram-based Instruction to Learn Vocabulary

No.	Statement	SD	D	N	A	SA	A + SA
1	I enjoy using pictograms to learn vocabulary.	0.0%	0.7%	10.3%	28.5%	60.5%	89.0%
2	I think pictograms assist me in recognizing the meanings of the words.	0.1%	1.6%	12.1%	30.8%	55.4%	86.2%
3	I think pictograms guide me to spell the words.	0.0%	2.1%	6.5%	29.2%	62.2%	91.4%
4	I think the pictures in pictograms enable me to recall the words.	0.0%	1.4%	10.4%	31.2%	57.0%	88.2%
5	I think using pictograms is a good way to learn new vocabulary.	0.4%	1.9%	7.4%	22.0%	68.3%	90.3%
6	I feel motivated when I use pictograms to learn spelling and meaning.	0.0%	1.7%	9.8%	27.3%	61.2%	88.5%
7	I feel much better when I use pictograms to learn spelling and meaning.	0.0%	1.9%	6.5%	28.0%	63.6%	91.6%
8	Using pictograms allows me to learn the meaning of words.	0.0%	2.8%	9.2%	29.1%	58.9%	88.0%
9	I think pictograms facilitate me in becoming familiar with words.	0.2%	0.7%	11.5%	28.1%	59.5%	87.6%
10	I feel comfortable when I use pictograms to learn vocabulary.	0.0%	1.2%	8.3%	31.2%	59.3%	90.5%
11	I would like to continue using pictograms to learn vocabulary.	0.1%	0.9%	10.2%	26.1%	62.7%	88.8%

Note. Percentages represent students' responses to each statement on a five-point Likert scale. SD = strongly disagree; D = disagree; N = neutral; A = agree; SA = strongly agree; A + SA = agreement total. Mean response distribution across the 11 items was 0.1% strongly disagree, 1.5% disagree, 9.3% neutral, 28.3% agree, and 60.8% strongly agree.

As shown in Table 6, the survey administered to the experimental group revealed highly positive perceptions of pictogram-based instruction. Across the 11 items, agreement and strong agreement consistently exceeded 86%. The highest levels of agreement were found for feeling better when using pictograms to learn spelling and meaning (91.6%) and for the perception that pictograms guided spelling (91.4%). Students also perceived pictograms as a good way to learn new vocabulary (90.3%) and reported feeling comfortable when using them (90.5%). These results suggest that students valued pictograms not only for recognition and memorization but also for confidence, comfort, and meaningful vocabulary use.

The qualitative results are also presented to show how students' interview responses complemented the questionnaire data and to make the triangulation process visible. In this context, the interview data from the 17 students in the experimental group were analyzed through reflexive thematic analysis. The analysis followed a recursive process of familiarization with the responses, semantic coding of students' explanations, grouping related codes into candidate themes, reviewing theme coherence, and selecting evidence that represented repeated patterns across participants rather than isolated comments. Initial codes captured ideas such as enjoyable activities, easier recall through images, spelling support, understanding word meaning, sentence use, and preference for pictogram-based tasks. These codes were then organized into four themes: motivation and engagement, vocabulary retention and recall, perceived usefulness of pictograms, and preferences and attitudes toward the strategy. Table 7 shows the link between initial coding, theme development, representative interview evidence, and the corresponding questionnaire findings.

Table 7. Themes Developed from Students' Interview Responses

Theme	Examples of initial codes	Theme development	Representative interview evidence	Link with questionnaire findings
Motivation and engagement	Enjoyable activities; more interesting lessons; active participation; reduced monotony.	Codes referring to enjoyment and interest were grouped because they described the affective and motivational role of pictogram-based tasks.	Students indicated that pictogram activities made lessons more interesting and enjoyable than routine vocabulary tasks.	Supports high agreement with items related to enjoyment, comfort, and positive attitudes toward using pictograms.
Vocabulary retention and recall	Remembering words through images; visual memory; easier recall; mental association between word and picture.	Codes related to memory and recall were grouped because students repeatedly described pictograms as visual anchors for retrieving vocabulary.	Students explained that the images helped them remember new words more easily and visualize the corresponding meaning when studying.	Complements questionnaire items indicating that pictograms helped students recognize meanings and recall words.
Perceived usefulness of pictograms	Understanding word meaning; spelling support; applying words in sentences; clearer vocabulary use.	Codes referring to usefulness were grouped because they described how pictograms supported comprehension, spelling, and application of vocabulary.	One student stated: "The pictograms help me understand what the words mean."	Directly supports items such as pictograms guide spelling and enable students to use words in sentences.
Preferences and attitudes toward the strategy	Preference for pictogram activities; willingness to continue using pictograms; positive learning experience.	Codes reflecting preferences were grouped because students described pictogram-based instruction as a strategy they would like to continue using.	Students reported a preference for pictogram-based activities over more traditional vocabulary exercises because they made learning easier and more attractive.	Reinforces the overall positive response pattern observed across the questionnaire items.

Note. The table makes the analytic path explicit by connecting examples of initial codes with the final themes and with the questionnaire patterns. Interview evidence is reported as translated representative evidence from students' explanations; direct quotation marks are used

only when an exact student excerpt was available in the manuscript material.

Analytic rigor was supported by maintaining a clear connection between interview questions, initial codes, themes, and representative evidence. In addition, the coding structure and final themes were reviewed by two EFL specialists to check their clarity, coherence, and alignment with students' responses. The themes were reviewed to ensure that they were internally coherent, distinguishable from one another, and aligned with recurring patterns in the interview responses. This process made triangulation explicit: the questionnaire showed high agreement regarding the usefulness and affective value of pictograms, while the interviews explained why students perceived them positively, indicating that pictograms made vocabulary more understandable, memorable, enjoyable, and manageable.

5. Discussion

5.1 How Does Pictogram-Based Instruction Impact Vocabulary Learning among Upper Primary EFL Students?

The findings for RQ1 provide strong evidence that pictogram-based instruction enhanced EFL vocabulary learning. Although both groups improved from pre-test to post-test, the significant Group $\times$ Time interaction showed that the improvement was substantially greater in the experimental group. This finding is stronger than a simple pre-post increase because it demonstrates that the experimental group benefited beyond the progress observed in the control group, which also received continued English instruction. The large gain-score effect further suggests that the intervention had educational relevance, not only statistical significance.

This advantage can be interpreted through theoretical frameworks such as Dual Coding Theory (Paivio, 1971), which proposes that combining verbal and visual input strengthens memory, and the Cognitive Theory of Multimedia Learning by Mayer (2002, 2009) that emphasizes the learning benefits of presenting information through both words and images. In line with these perspectives, pictograms likely functioned as visual scaffolds that complemented verbal instruction, reduced abstraction, and facilitated vocabulary comprehension and retrieval. Similar patterns have been reported in previous studies on visual and multimodal vocabulary learning, which suggest that multimodal resources can support vocabulary retention and learner engagement (Chung, 2023; Sadoski, 2005; Teng et al., 2023).

These findings suggest that pictogram-based instruction should not be considered a replacement for traditional teaching methods, but rather a valuable complement within vocabulary instruction. By linking new lexical items to concrete visual representations, pictograms may make vocabulary learning more accessible, particularly for young learners. However, their effectiveness depends on thoughtful instructional integration, since poorly designed visuals may impose unnecessary cognitive load (Mayer, 2002). Therefore, pictograms appear to be a practical and inclusive strategy for enriching language instruction while supporting more engaging learning experiences and potentially more equitable vocabulary development.

5.2 To What Extent Do the Effects of Pictogram-Based Instruction on EFL Students' Vocabulary Learning Differ by Gender?

Regarding RQ2, the results indicate that the effects of pictogram-based instruction on vocabulary gains differed by gender, but only within the experimental condition. Specifically, the significant Group $\times$ Gender interaction showed that the effect of the instructional condition on vocabulary gains was not the same for female and male students. In the control group, gains were small and did not differ significantly between females and males. In contrast, in the experimental group, both genders improved, but females showed significantly larger gains than males. Importantly, females in the experimental group began with lower pre-test scores but reached nearly identical post-test means to males. Therefore, the results suggest that pictogram-based instruction was associated with vocabulary improvement in both genders, with relatively larger gains among females in the experimental group; however, because baseline differences were present, this pattern should be interpreted cautiously rather than as evidence of a fixed gender advantage.

A possible explanation for this pattern is that pictograms provided visual support that helped learners connect word forms and meanings more efficiently during instruction. This interpretation is consistent with Multimedia Learning Theory, which proposes that learning is strengthened when verbal and visual information are meaningfully integrated (Mayer & Moreno, 2003). Recent evidence also shows that multimedia glosses have a positive overall effect on foreign language vocabulary learning, with stronger benefits for beginner learners and for recognition-based assessments (Mahdi et al., 2024). In this sense, the larger gains observed among females in the experimental group may be understood in relation to the fact that they started from a lower pre-test level and may therefore have benefited more from the visual support provided by pictograms, rather than as a general gender-based advantage. This interpretation is also compatible with classroom-based evidence showing that multimodal glosses can support vocabulary development in EFL settings (Paudel, 2025).

5.3 What Are Students' Perceptions of Using Pictogram-Based Instruction to Learn Vocabulary in EFL Classrooms?

The perceptions expressed by the students in the experimental group highlight that pictogram-based instruction is not only effective in facilitating vocabulary learning but also well-received by learners. The consistently high levels of agreement, with over 89% of students indicating positive views across items, suggest that pictograms create a supportive, enjoyable, and motivational learning environment. This aligns with previous research that emphasizes the motivational role of visual resources in language learning, as visuals reduce abstraction and make vocabulary more accessible (Chung, 2023). When students feel comfortable and confident with a learning tool, they are more likely to engage actively and retain new knowledge.

Furthermore, these positive perceptions are consistent with other studies that document the value of multimodal instruction for engagement and learning outcomes. Teng et al. (2023) demonstrated that multimedia input improves vocabulary retention, while Li et al. (2022) emphasized that visuals, when carefully integrated, optimize both learning and motivation. The high percentages of agreement in the present study mirror these results, showing that pictograms can strengthen learners' sense of progress and enjoyment. Such findings

reinforce the idea that beyond measurable performance gains, learners' subjective experiences are critical indicators of the effectiveness of instructional innovations. By fostering positive perceptions, pictograms may sustain students' long-term motivation to continue learning a foreign language.

These findings can be also understood considering established theories such as the Dual Coding Theory (Paivio, 1971), which posits that the integration of verbal and non-verbal information strengthens memory traces and enhances retrieval. Students' perceptions that pictograms guided them in spelling and using words in context provide practical confirmation of this theoretical principle. Similarly, Mayer's (2009) Cognitive Theory of Multimedia Learning explains that combining verbal explanations with meaningful visuals reduces cognitive load and supports deeper processing. The students' comfort and sense of improvement when using pictograms resonate with this framework, suggesting that pictograms not only facilitate learning but also reduce anxiety associated with language tasks.

6. Conclusion

This study provides evidence that pictogram-based instruction was associated with enhanced EFL vocabulary learning among upper primary students in public schools. Although both the control and experimental groups improved over time, the experimental group showed a significantly larger improvement, as demonstrated by the Group x Time interaction and the larger mean gain. These findings indicate that pictogram-based instruction added value beyond regular classroom instruction.

The gender analysis indicated that pictogram-based instruction supported vocabulary gains in both females and males, with relatively larger gains among females in the experimental group. However, because females in that group began with lower pre-test scores and reached post-test means close to those of males, this pattern should be understood as a conditional outcome linked to the instructional context and initial performance differences, rather than as evidence of a stable gender advantage.

The perception data further strengthened these findings. Students in the experimental group reported highly favorable views of pictogram-based instruction, and interview responses confirmed that pictograms were perceived as motivating, helpful for remembering words, and supportive of vocabulary use. Taken together, the convergence of test performance, survey responses, and interview evidence suggests that pictogram-based instruction can support both the cognitive and affective dimensions of EFL vocabulary learning.

From a pedagogical perspective, these findings support the systematic integration of pictograms as visual scaffolds in vocabulary instruction, particularly in primary or lower-proficiency EFL settings. Future research should replicate these findings using delayed post-tests, baseline-controlled models, and broader samples to examine the stability, generalizability, and longer-term effects of pictogram-based instruction across contexts. On the whole, the study contributes classroom-based evidence that visually scaffolded vocabulary instruction can promote meaningful vocabulary gains while also being positively received by young EFL learners.

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Author contributions

All authors contributed equally to the current research. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Written informed consent was obtained from the parents or legal guardians of all minor participants before their involvement in the study. Participation was voluntary, and the students were informed about the educational purpose of the activities and their role in the research. No personal data, identification numbers, or sensitive information of the participants were collected; all data were anonymized and used solely for academic and research purposes. The informed consent forms administered to parents/legal guardians are retained by the authors and can be made available upon reasonable request.

Ethics Approval

This study involved minor participants (students aged 10–11) and was conducted in an educational EFL classroom context. Because all data were collected anonymously—through pre- and post-tests, a perceptions questionnaire, and semi-structured interviews in which no personally identifiable information of the participants was recorded—the research was classified as no-risk educational research under Article 27 of the Internal Regulations of the CEISH-UTPL (Comité de Ética de la Investigación en Seres Humanos, Universidad Técnica Particular de Loja). Under Article 27, studies based on anonymized data and anonymous evaluation of educational practices are exempt from prospective review by the institutional Research Ethics Committee. Consequently, formal ethics approval from CEISH-UTPL was not sought prior to data collection. The study additionally received an academic review at the program level by the Pedagogía de los Idiomas Nacionales y Extranjeros UTPL program, which confirmed its academic relevance and educational purpose; this program-level

review is distinct from, and does not substitute for, approval by an institutional ethics committee. CEISH-UTPL does not issue retrospective approvals or waivers for research that has already been completed (Article 30), and none was requested.

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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