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# Bridging the Gap Between L1 and L2: Enhanced Emotional Vocabulary Through Elaborative Processing in Spanish-Speaking English Language Learners

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## ABSTRACT

Foreign languages are often learnt in formal and disembodied environments which may limit the emotional resonance of their vocabulary and their pragmatic usage in real-life communication. In a context of English as a foreign language (EFL), this study examines whether elaborative processing as a teaching strategy leads to changes in the affective evaluation of English words and thus enhances the acquisition of emotional vocabulary. A pre-test/post-test design was employed in order to assess the effect of this type of instruction. A group of 35 Spanish EFL students participated in two training sessions, with generative processing exercises that involved multiple modalities (visual and spoken language, body expression, and gestures) at production and comprehension domains and that focused on 36 English words (12 positive, 12 negative, and 12 neutral). Another set of 36 non-trained words was carefully selected and matched to trained words across several psycholinguistic variables. Crucially, stimuli selection was based on their high emotional discrepancy between English native speakers and Spanish EFL learners, as observed in our normative study. The students rated the full set of 72 words in two emotional dimensions (valence and arousal) before and after the instruction. Results revealed the enhancement of the negative emotional connotations for negative trained words in EFL and an alignment with the affective responses reported by English native speakers. These findings confirm the effectiveness of this elaborative processing approach for the teaching of emotional vocabulary in formal contexts of EFL. The stronger impact of this instruction on negative emotional language suggests its attenuation in additional languages and underscores the importance of addressing this type of language in EFL instruction.

## Resumen

Los idiomas extranjeros suelen aprenderse en entornos formales y descontextualizados, lo que limita la resonancia emocional de su vocabulario y su uso pragmático en la comunicación real. En un contexto de inglés como lengua extranjera (EFL), este estudio examina si el procesamiento elaborativo como estrategia didáctica produce cambios en la evaluación afectiva de palabras en inglés y, por tanto, mejora la adquisición de vocabulario emocional. Se empleó un diseño pretest/postest para evaluar el efecto de este tipo de instrucción. Un grupo de 35 estudiantes españoles de EFL participó en dos sesiones de entrenamiento con ejercicios de procesamiento generativo que implicaban múltiples modalidades (lenguaje visual y oral, expresión corporal, gestos) en tareas de

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producción y comprensión, y que se centraron en 36 palabras en inglés (12 positivas, 12 negativas, 12 neutras). Otro conjunto de 36 palabras no entrenadas se seleccionó cuidadosamente y se emparejó con las entrenadas en diversas variables psicolingüísticas. Es fundamental destacar que la selección de estímulos se basó en su alta discrepancia emocional entre hablantes nativos de inglés (Warriner et al., 2013) y aprendices españoles de EFL, tal como se observó en nuestro estudio normativo (Bermúdez-Margaretto et al., 2025). Los estudiantes evaluaron el conjunto completo de 72 palabras en dos dimensiones emocionales (valencia y activación) antes y después de la instrucción. Los resultados revelaron una intensificación de las connotaciones emocionales negativas para las palabras negativas entrenadas en EFL y una alineación con las respuestas afectivas reportadas por hablantes nativos de inglés. Estos hallazgos confirman la eficacia de este enfoque de procesamiento elaborativo para la enseñanza de vocabulario emocional en contextos formales de EFL. El mayor impacto de esta instrucción en el lenguaje emocional negativo sugiere su atenuación en lenguas adicionales y subraya la importancia de abordar este tipo de lenguaje en la enseñanza de EFL.

## 1 | Introduction

The complex interplay between emotion and vocabulary processing in monolingual and multilingual contexts has been widely researched over the last decades (Aguilar et al. 2024). In first languages (L1s), emotional vocabulary<sup>1</sup> tends to be processed more effortlessly overall. L1 users can understand not only their meaning but also their emotional significance, instinctively connecting them to personal memories and cultural experiences, and thus, evoking an embodied emotional response (Pavlenko 2012). However, in additional languages<sup>2</sup> (e.g., second languages, L2s), a term that also embraces foreign language (FL) students (Dewaele 2018), the processing of emotional words typically lacks that automatic affective embodiment, despite an understanding of their semantic content (Norman and Peleg 2022). This reduced emotionality in L2s compared to L1s often stems from learning them in structured, emotionally limited contexts such as formal classroom instruction, which prevents their integration with personal and autobiographical experiences. As Toivo et al. (2024, 435) argue “LX words are more likely to be stored in the learner’s declarative memory, meaning the user can access them and translate them, but multimodal connections remain sparse and weak.” As a result, while L1 speakers may naturally react to emotionally charged words, L2 users tend to engage with them in a more analytical manner, without experiencing the same emotional impact. Behavioral studies using emotionality ratings, lexical decision, Stroop, or priming tasks (Degner et al. 2012; Segalowitz et al. 2008; Winskel 2013) as well as physiological (pupillometry: Toivo and Scheepers 2019; skin conductance: Baumeister et al. 2017) and neurophysiological evidence (Fan et al. 2016; Jończyk et al. 2016; Opitz and Degner 2012) have consistently observed a less deeper emotional language processing in L2s.

While emotional resonance and linguistic competence remain separate dimensions (Toivo et al. 2024), increased L2 exposure, usage, and proficiency can enable L2 users to exhibit emotional responses more similar to native speakers and thus reduce the emotional disadvantage in the L2 (Abutalebi 2008; Pérez-García 2025; Ponari et al. 2015; Sharif and Mahmood 2023). Consistent interaction and authentic communication support L2 users in internalizing how linguistic and paralinguistic cues—such as intonation, pitch, gesture, and facial expression—encode emotional meaning (Caldwell-Harris and Ayçiçeği-Dinn 2009; Sutton et al. 2007). However, in formal FL contexts, the development of

L2 learners’ linguistic and sociopragmatic competence—which includes the ability to communicate emotions and relies on authentic, continuous interaction with native speakers—takes more time to develop fully. This is because the classroom environment lacks real exposure to the emotional dimension of language and, more importantly, does not provide systematic practice opportunities (Dewaele 2015; Kralova et al. 2022). Albeit being challenging, emotional language in general, and emotional vocabulary in particular, must be explicitly taught in the FL classroom through the implementation of targeted exercises and activities that support its internalization to help students acquire the emotional connotations of L2 words and ultimately enhance effective emotional communication in the L2 (Pérez-García and Sánchez 2020; Sánchez and Pérez-García 2020; Sánchez et al. 2022). Without explicit instruction, students will often rely on their L1’s emotional associations instead of fully internalizing the affective meaning in their L2, which limits their ability to think and feel in the new language (Blanco Canales and Pérez-García 2024). In this context, the present study explores the effects of explicit instruction based on elaborative processing to improve the acquisition of emotional vocabulary and its affective connotations in a formal English as a foreign language (EFL) setting.

### 1.1 | Emotional Vocabulary Teaching in Foreign Languages

In accordance with the updated descriptors in the *Common European Framework of Reference for Languages* (CEFR, Council of Europe 2020) that emphasize the importance of emotional expression in language learning, there has been a noticeable interest in incorporating not only emotional lexicon in FL textbooks (e.g., Sánchez and Pérez-García 2020) but also in the explicit teaching of emotional vocabulary in the FL classroom (e.g., Bustos López and Mavrou 2018; Sánchez et al. 2022). Despite its growing interest, this lexical domain and its learning are still underrepresented in teaching materials and language curricula (Dewaele 2015; Lasekan et al. 2025). The following lines present studies showing that emotional words and emotional literacy can be effectively taught through various teaching strategies. More specifically, the review emphasizes the benefits of elaborative processing methods for learning the emotional meanings of words in FLs.

Elaborative processing involves linking new information to prior knowledge through personal connections (memories or experiences), vivid imagery, associations, or examples. These strategies go beyond surface-level learning, allowing learners to engage deeply with language and enhance understanding, retention, and emotional resonance of words (Kühl and Bertrams 2019; Priawasana et al. 2020; Tay 2013). Rather than receiving word information passively, learners actively enrich it by making connections with previous knowledge, personal experiences, or cultural contexts (Sperling et al. 2016). This deeper engagement facilitates encoding, supports richer representations and enables transfer to new situations. For example, instead of memorizing emotional vocabulary, learners can compare emotional meanings across cultures, link them to personal experiences, define them in their own words, or use gestures. This last strategy, learning by enacting (Fiorella and Mayer 2016), aligns with embodied cognition theories (Barsalou 2008; Glenberg 2008) and generative learning theory (Fiorella 2023), helping to internalize emotional language within a richer cognitive and affective framework for more durable learning.

Among the few studies that have tested the effectiveness of teaching emotional vocabulary in learners of EFL, Sánchez et al. (2022) compared two strategies: context provision and imagination elicitation to the teaching of emotional words to Spanish-speaking learners of EFL, measuring their ability to recall and use them over time. The results indicated that, while both approaches contributed positively to vocabulary learning, the imagination elicitation one led to deeper emotional engagement and better long-term retention compared to context provision. The findings suggest that encouraging (E)FL learners to actively visualize and emotionally connect with new words enhances their ability to remember and use them effectively, highlighting the significance of incorporating affective-cognitive strategies in language teaching. In a subsequent intervention study, the authors (2025) tested the effectiveness of two similar strategies—summary writing and guessing writing—for the teaching of emotional writing. Both strategies activated elaborative processing, as they required learners to engage in cognitive activities that involved interpretation, inference, and imagination processes, thereby fostering meaningful learning. While the intervention did not significantly enhance the overall emotionality of the written texts, it was observed that both experimental groups wrote texts that were less objective. Moreover, among the two strategies, the summary writing showed a greater reduction in analytical language.

Bustos López and Mavrou (2018), who found that learners of Spanish as a foreign language recalled more emotional words in their L1 than in their L2—although higher proficiency and visual presentation improved L2 recall, especially for positive words—concluded by emphasizing the need for more comprehensive teaching approaches grounded in neuroscientific principles (Sharif and Mahmood 2023). Similarly, research consistently highlights the benefits of emotionally rich instruction for L2 vocabulary learning. Turrero-García and Faber (2018) showed that materials evoking positive affect enhance word recall and recognition, advocating for emotionally driven teaching and materials. Similarly, Kralova et al. (2022) found that multisensory, positive emotional stimuli improved vocabulary retention and enjoyment, urging longer, integrated interventions.

Kanazawa (2024) further demonstrated that embedding words in emotionally charged contexts—positive or negative—and using vivid imagery strengthens vocabulary learning and retention, supporting his *Emotion-Involved Processing Hypothesis*.

Taken together, the above research indicates that (1) explicit instruction of emotional vocabulary and overall affective competence can be taught and improved in the FL classroom; (2) the integration of emotional connotations in instructional materials (both positive and negative vocabulary through various sensory modalities) plays a crucial role in enhancing this emotional learning; and (3) elaborative processing strategies combining emotional contexts with mental imagery foster better word retention and understanding by promoting richer and deeper cognitive processing. While these studies emphasize the value of adding emotional content to language curricula, research following foreign language learners over time is still needed to see if elaborative processing methods can sustain emotional engagement in a foreign language and reduce the weaker emotional responses often seen compared to native speakers.

## 1.2 | Objective and Hypotheses

Building on evidence that emotional vocabulary can be explicitly taught, this study examines how elaborative processing instruction enhances learners' sensitivity to emotional vocabulary and modulates its affective connotations in a formal EFL context. Its novelty lies in the lexical selection, based on emotional discrepancies in valence ratings between English native speakers (Warriner et al. 2013) and Spanish EFL learners from our normative study. Unlike traditional approaches guided by frequency or textbook relevance, we specifically targeted words showing the greatest L1–L2 divergence in emotional valence. Accordingly, we proposed the following hypotheses:

**Hypothesis 1.** *Students' valence and arousal word ratings in EFL will show a significant change between pre- and post-intervention phases, reflecting modified emotional ratings for target vocabulary due to the intervention.*

**Hypothesis 2.** *There will be a significant reduction of the divergence between EFL students' word ratings in valence and arousal at the post-intervention phase and those reported by English L1 speakers (Warriner et al. 2013), indicating more native-like emotional processing patterns.*

**Hypothesis 3.** *There will be a significant relation between students' emotional word ratings and characteristics and usage patterns of the English language. Specifically, we expect more extreme valence ratings (both positive and negative) and higher arousal ratings among learners with greater competence, usage, and emotional experience in EFL.*

## 2 | Method

### 2.1 | Participants

Initially, 42 students from the first year of the English Studies degree at a university in Spain signed up to participate in the

TABLE 1 | Participants' L2 characteristics.

	Mean	SD	Max	Min
<b>Average proficiency (LEAP-Q) in L2 English (0–10 scale)</b>	7.72	0.70	9	5.75
<b>LexTALE score (%)</b>	70.75	9.36	88.75	48.75
<b>RER-LX (English) score (%)</b>	66.65	7.72	84.09	48.48
<b>Age of L2 (English) acquisition</b>	4.34	2.52	15	2
<b>Age of L2 (English) fluency acquisition</b>	12.43	2.10	18	8

research. The data of seven participants were eliminated because they had a mother tongue other than Spanish or because they had not attended one of the two instruction sessions and/or the post-test. Thus, the final number of participants was 35 (1 male, 2 other gender, 32 females; mean age = 18.20, SD = 1.05, range = 17–22 years). All participants were Spanish learners of EFL (mean years of formal education = 14.26, SD = 2.56, max = 19, min = 6). They had normal or corrected-to-normal vision and no history of developmental disorders or special educational needs. They participated voluntarily and were given extra credit for their participation in their English language course (see Table 1 for more characteristics of their L2 English).

## 2.2 | Stimuli

The emotional vocabulary was selected from a normative study of affective ratings (valence and arousal) for English L2 words rated by Spanish EFL learners and previously conducted in our laboratory (Bermúdez-Margaretto et al. 2025). From our L2 norms, we selected as lexical stimuli those words that exhibited the most discrepancy compared to those reported by English L1 speakers (Warriner et al. 2013). In particular, the words whose L2 rating was 1 SD above or below the mean in L1 were considered discrepant in valence and arousal. With this procedure, we identified 109 words with L1–L2 discrepancy in valence and 144 words in arousal. Among both sets, there were only two words in common (*to mar* and *creek*). Whereas discrepant words in arousal showed a reduced distribution, with scores ranging from 1 to 5.95 and including only medium and low arousing words, discrepant words in valence showed a spread distribution, as their scores ranged between 1.61 and 7.76, including negative (scores >1 and ≤4), neutral (scores >4 and <6), and positive words (scores ≥6). Therefore, we decided to use the words with L1–L2 discrepancy in the valence dimension.

From those 109 words, we selected a final set of 72 words (24 positive, 24 negative, and 24 neutral). Half of the words in each valence condition (12 positive, 12 negative, and 12 neutral) were selected to be presented in the instruction, and the other half served as control (thus, 36 words were trained and 36 words were not trained). Critically, words across each valence and training condition were matched in arousal (Warriner et al. 2013), lexical frequency (log10, Van Heuven et al. 2014), concreteness (Brysbart et al. 2014), and number of letters (see Table S2 for matching means across conditions in the different variables). To ensure that there were no differences between conditions, contrasts were carried out between each pair of conditions by means of independent sample *t*-tests performed on each psycholinguistic

variable, indicating no significant differences except for valence, as expected. We also ensured that words were balanced in terms of grammatical category (Brysbart et al. 2014) across valence conditions (positive: 18 nouns, 4 adjectives, and 2 verbs; negative: 17 nouns, 4 adjectives, and 3 verbs; and neutral: 17 nouns, 3 adjectives, and 4 verbs). The level of difficulty was also controlled by considering the CEFR (Council of Europe 2020) that classifies most of these words at upper-intermediate and advanced levels. Specifically, 75% of the words fell within the B2 (51.38%; 14 negative terms, 11 positive, and 13 neutral) and C1 levels (23.61%; 8 negative terms, 6 positive, and 3 neutral). This distribution suggests that the vocabulary is relatively sophisticated, requiring an upper-intermediate to advanced level of linguistic competence to fully comprehend and use it effectively. See Table S1 for the full set of words used in the study, their characteristics and scores across controlled psycholinguistic variables.

## 2.3 | Procedure

A pre-test/post-test design was employed to evaluate the effectiveness of the instruction, which consisted in the training of the 36 words set (12 positive, 12 negative, and 12 neutral). Participants were assessed before (pre-test) and after (post-test) the instruction by asking them to subjectively rate the valence and arousal of the 72 stimuli (the 36 trained and the 36 not trained words). This allowed us to measure changes in word valence and arousal attributable to the intervention. Due to the classroom setting, where all participants belonged to the same level in different groups, the study followed a quasi-experimental approach rather than a fully randomized one. See Table S3 outlining the complete procedure.

Prior to the pre-test, participants were provided with information about the approval of the research by the Ethics Committee of the University of Salamanca and they were asked to sign an informed consent form. They completed an online questionnaire through Qualtrics and during class time to collect their sociodemographic data and linguistic profiles. They responded to (1) the LexTALE test (Lemhöfer and Broersma 2012), a quick standardized lexical decision test which has been extensively used to check English proficiency from medium to highly proficient learners; (2) an adapted version of the LEAP-Q (Marian et al. 2007), which provided information on their English learning background and self-rated proficiency; and (3) the RER-LX (Toivo et al. 2024), a psychometric scale for measuring the reduction of emotional resonance in the LX relative to the L1. The scale comprises 22 items where participants must indicate their degree of agreement (from 1 *strongly disagree* to 6 *strongly agree*) with each statement. The

instructions were modified to reflect participants' L1 (Spanish) and LX (English). A higher score on the scale means a stronger emotional discrepancy between their L1 and LX. See Table 1 for mean scores obtained by participants in these tests.

The pre-test and post-test included a valence and an arousal rating task in which the full set of 72 English words was presented. Participants were asked to rate each word on the valence (from 1 *unhappy* to 9 *happy*) and arousal (from 1 *calm* to 9 *excited*) dimensions. They had the option to indicate whether the word presented was unknown. The order of the emotional dimension as well as the items presented in each dimension were randomized. Both rating tasks included six examples (calibrator words) for practice and were also administered online via Qualtrics and during class time.

The instruction was conducted in two 60-min sessions, scheduled outside regular class hours to avoid interference with the students' English language classes. The 36 trained words were divided between the two sessions, with each session including 18 words (6 positive, 6 negative, and 6 neutral). In line with cognitive and educational psychology frameworks and in order to promote deeper processing and vocabulary retention, both sessions followed the same structure to ensure consistency and effectiveness of instruction. Each session included a total of four activities focused on elaborative processing in which students worked with target words through multiple sensory modalities, not just verbal language (see the materials used in the instruction in Supporting Information):

1. *Defining through body language and gestures* (20 min). Students worked in groups of four or five to define each target word (18 per session), engaging in semantic elaboration. Then, they reinforced this learning by using body language and gestures to physically represent word meanings, a strategy that enhances memory encoding by linking physical movement to word meaning. Whole-class corrections reinforced accurate understanding.
2. *Filling sentences* (8 min). Afterward, each student filled in 18 sentences using the critical vocabulary. This sentence-completion activity aligns with generative processing, a relevant elaborative technique in vocabulary learning. Whole-group corrections were done to ensure comprehension.
3. *Producing sentences* (12 min). Students worked in groups of four or five to produce original sentences incorporating the target vocabulary. This collaborative generative processing task, combining original sentence creation with peer review, represents an effective elaborative technique that simultaneously enhances lexical acquisition while promoting peer-assisted learning and linguistic accuracy.
4. *Emotional categorization and rating* (20 min). Students individually categorized words based on elicited emotions, and then they ranked them according to emotional intensity. This task was designed to help students engage deeply with the emotional content and intensity of vocabulary, aiding emotional vocabulary acquisition and emotional awareness. Feedback was provided for in-depth discussion of responses.

Furthermore, to enhance comprehension, retention, and internalization of the taught vocabulary, students were assigned

homework exercises for each teaching session. These assignments were designed to reinforce learning through three key activities:

1. *Contextual application*. Students identified appropriate scenarios for using the new words, reinforcing their understanding of proper usage.
2. *Semantic networking*. Learners generated words related to the critical terms, strengthening associative memory and expanding their lexical network.
3. *Textual coherence*. Participants arranged paragraphs containing the target words to form a coherent text, promoting understanding of the words in broader linguistic contexts.

To ensure accuracy and provide timely feedback, students submitted their completed homework exercises via a Google Forms questionnaire. To mitigate the proximity effect in learning, which can lead to short-term memorization rather than long-term retention, access to homework was delayed until the following day. Students were then allotted a 2-day window to complete the assignments, encouraging spaced practice and deeper processing of the material. Upon submission, they received immediate access to the correct answers, allowing for prompt self-assessment and reinforcement of learning. This pedagogical approach, which integrated spaced practice with immediate feedback (Belardi et al. 2021), aimed to enhance vocabulary learning by promoting both immediate comprehension and durable retention of the target lexical items.

## 2.4 | Data Analysis

Data analyses were carried out in JASP software (JASP Team 2023, version 0.17.1). First, in order to determine the effect of the instruction in the emotional response to trained words, valence and arousal ratings collected for trained and non-trained words before and after the instruction were analyzed by means of linear mixed-effect models. In particular, valence and arousal ratings were considered as dependent variables in separated models, which included the categoric variables training (trained and non-trained words), valence (positive, negative, and neutral words) and session (pre- and post-instruction) as fixed factors (models involved 5040 observations). Subjects and word items were considered as random factors.

Second, we aimed to determine whether the instruction reduced the discrepancy between the ratings provided by EFL learners and those of English L1 speakers, thereby aligning learners' emotional processing more closely with that observed in L1 users. To this end, we calculated the difference between our participants' L2 English ratings and those of English L1 speakers (Warriner et al. 2013) for both valence and arousal across trained and non-trained words in the pre- and post-tests. Separate models were then fitted for the L1-L2 differences in valence and arousal, using the same fixed and random factors described before.

Finally, we aimed to investigate the relationship between our EFL learners' valence and arousal ratings before and after the training, their L2-related characteristics, and the valence-arousal patterns observed in English L1 speakers. To this end, weighted networks

were performed and analyzed using graph theory (Newman 2010), focusing on valence and arousal ratings for trained words across the pre- and post-instruction phases and their associations with the variables of interest. Specifically, the variables included in the weighted networks comprised: age of L2 English acquisition, age of L2 fluency, subjective and objective measures of L2 competence (the LEAP-Q and LexTALE, respectively), the degree of reduced L2 emotional resonance (RER-LX scores), and English L1 valence and arousal scores. In these networks, each variable is represented as a node, whereas the statistical relationship between variables is represented by the different edges. Partial correlations were used to estimate the weighted networks. In particular, pairwise associations between variables were estimated using an automatic correlation method which selects the most appropriate correlation coefficient based on variable type (e.g., Pearson, tetrachoric, and polychoric). Furthermore, correlations were computed following a non-parametric bootstrap procedure with 1000 resampling iterations to ensure edge stability and reliability. A significance threshold at the 0.05 level was applied to retain only edges that were statistically reliable, thus enhancing the interpretability of the network structure.

### 3 | Results

#### 3.1 | Modulation of L2 Emotional Ratings Across Test Sessions

##### 3.1.1 | Valence Ratings

Linear mixed-effect models revealed significant effects of valence and session, and interactions between valence\*session and, importantly, between training\*valence\*session (see Table 2 for significance of fixed effects). Contrasts between valence ratings at pre- and post-test sessions showed a significant modulation in valence after the training, particularly for negative trained words which were assessed more negatively (mean pre-test:

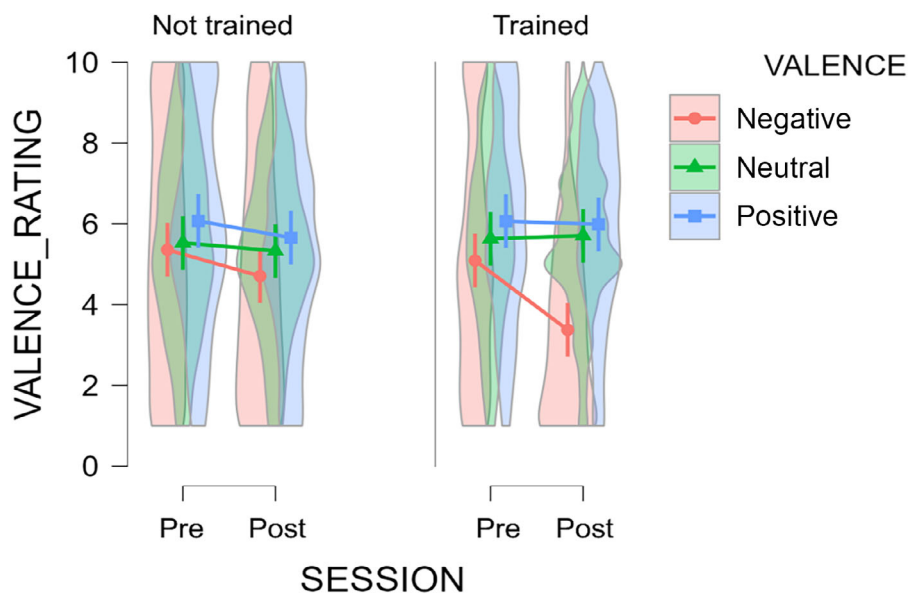
**TABLE 2** | Significance of fixed effects obtained in the model for valence ratings.

Effect	df	ChiSq	p
VALENCE	2	15.612	<0.001
TRAINING	1	0.252	0.616
SESSION	1	67.027	<0.001
VALENCE * TRAINING	2	3.151	0.207
VALENCE * SESSION	2	65.196	<0.001
TRAINING * SESSION	1	1.563	0.211
VALENCE * TRAINING * SESSION	2	28.292	<0.001

Note: Model terms tested with likelihood ratio tests test method.

5.09, post-test: 3.37, diff. pre-post: 1.71; see Figure 1). Conversely, valence ratings for positive and neutral trained words did not show modulation across pre-test and post-test sessions ( $p = 1$ ). Regarding non-trained words, a slight reduction was observed across sessions for positive (diff. pre-post: 0.41) and negative words (diff. pre-post: 0.65), likely indicating a repetition effect which was not observed for non-trained neutral words (see Tables S4, S5, and S6 for fixed effects estimates of the model, estimated marginal means, and statistical contrasts).

Furthermore, the instructional effect—reflected in the stronger negative valence shown for negative words after training—reduced the disparity between EFL learners and English L1 speakers in their affective responses to these stimuli. Thus, the model using the absolute difference between L1 and L2 valence ratings as the dependent variable revealed a significant training\*valence\*session interaction. The contrasts indicated a significant reduction of L1–L2 differences in valence ratings for negative trained words across sessions (mean pre-test: 2.845, post-test: 1.625, diff. pre-post: 1.22) and, in a lower extent, for positive



**FIGURE 1** | Mean valence ratings for trained and non-trained words across the three valence conditions in the pre-test session before the instruction and the post-test session after the instruction. [Color figure can be viewed at wileyonlinelibrary.com]

**TABLE 3** | Significance of fixed effects obtained in the model for arousal ratings.

Effect	df	ChiSq	p
VALENCE	2	5.483	0.064
TRAINING	1	6.071	0.014
SESSION	1	2.930	0.087
VALENCE * TRAINING	2	1.074	0.584
VALENCE * SESSION	2	4.866	0.088
TRAINING * SESSION	1	0.257	0.612
VALENCE * TRAINING * SESSION	2	1.473	0.479

Note: Model terms tested with likelihood ratio tests test method.

trained words (mean pre-test: 2.028, post-test: 1.691, diff. pre-post: 0.33), whereas no significant L1–L2 difference reduction was observed for neutral trained words ( $p = 0.06$ ; see Tables S7–S10 for fixed effects, estimated marginal means, and contrasts for this model). Importantly, this analysis was conducted using the absolute L1–L2 difference scores, which capture the magnitude of the reduction in L1–L2 differences while disregarding the direction (positive or negative) of those differences and their modulation. Hence, to verify that the reduction in L1–L2 differences was specifically driven by the decreased valence ratings for negative trained words, the same analysis was repeated using the relative, signed L1–L2 valence differences rather than absolute values. This analysis again confirmed that the three-way training\*valence\*session interaction was primarily driven by the post-instruction decrease in valence ratings for negative trained words, which produced a stronger attenuation of L1–L2 differences for these items (L1–L2 valence difference at pre-test:  $-2.79$ , at post-test:  $-0.36$ , diff. pre-post:  $-1.71$ ). See Tables S11–S14 for fixed effects, estimated marginal means, and contrasts for this model.

## 3.2 | Arousal Ratings

Linear mixed-effects models for the analysis of arousal ratings (see Table 3) revealed a significant effect of training, indicating lower arousal scores for trained than for not trained words (mean trained: 5.33 and non-trained: 5.75; diff.: 0.41), regardless of the valence or the test session (see Tables S15 and S16 for estimated marginal means). No other effects or interactions resulted significant in the analysis. Since no specific change across pre- and post-test sessions was found in arousal due to the instruction, no further analyses on the L1–L2 difference in arousal scores were carried out.

## 3.3 | Relation Between L2 Emotional Ratings and L2 Variables Across Instruction Sessions

### 3.3.1 | Valence Ratings

The weighted network for valence ratings of trained words (see Figure 2, upper panel) shows that, at the pre-instruction session, EFL learners' valence ratings were modestly related with those

exhibited by English L1 speakers. However, after the instruction, a strong, positive correlation emerged between valence scores in EFL and L1 English, indicating higher similarity in the affective evaluations provided by both groups after the training.

Correlations between learners' valence ratings and other L2 variables were particularly weak (all  $r$  lower than 0.1,  $p < 0.05$ ), suggesting no strong association. Because valence is a bipolar dimension—where lower scores reflect more negative evaluations for negative words but less positive evaluations for positive words—Figure 2 (upper panel) also presents valence ratings within each valence category to allow for a clearer interpretation of these effects and their relation to participants' L2 characteristics. Interestingly, in both test sessions, a significant negative correlation emerged between participants' negative valence ratings and their level of L2 competence (objectively measured with LexTALE), hence indicating lower negative valence scores at higher competence levels. Lower negative valence scores at the pre-test were also associated with higher L2 fluency acquisition. Moreover, a significant negative correlation emerged at the post-test between positive valence ratings and RER-LX. This means that participants with higher emotional resonance in L2 English provided more positive evaluations for positive words after the training (note that RER-LX must be interpreted at reverse, since low scores indicate high emotional resonance in L2).

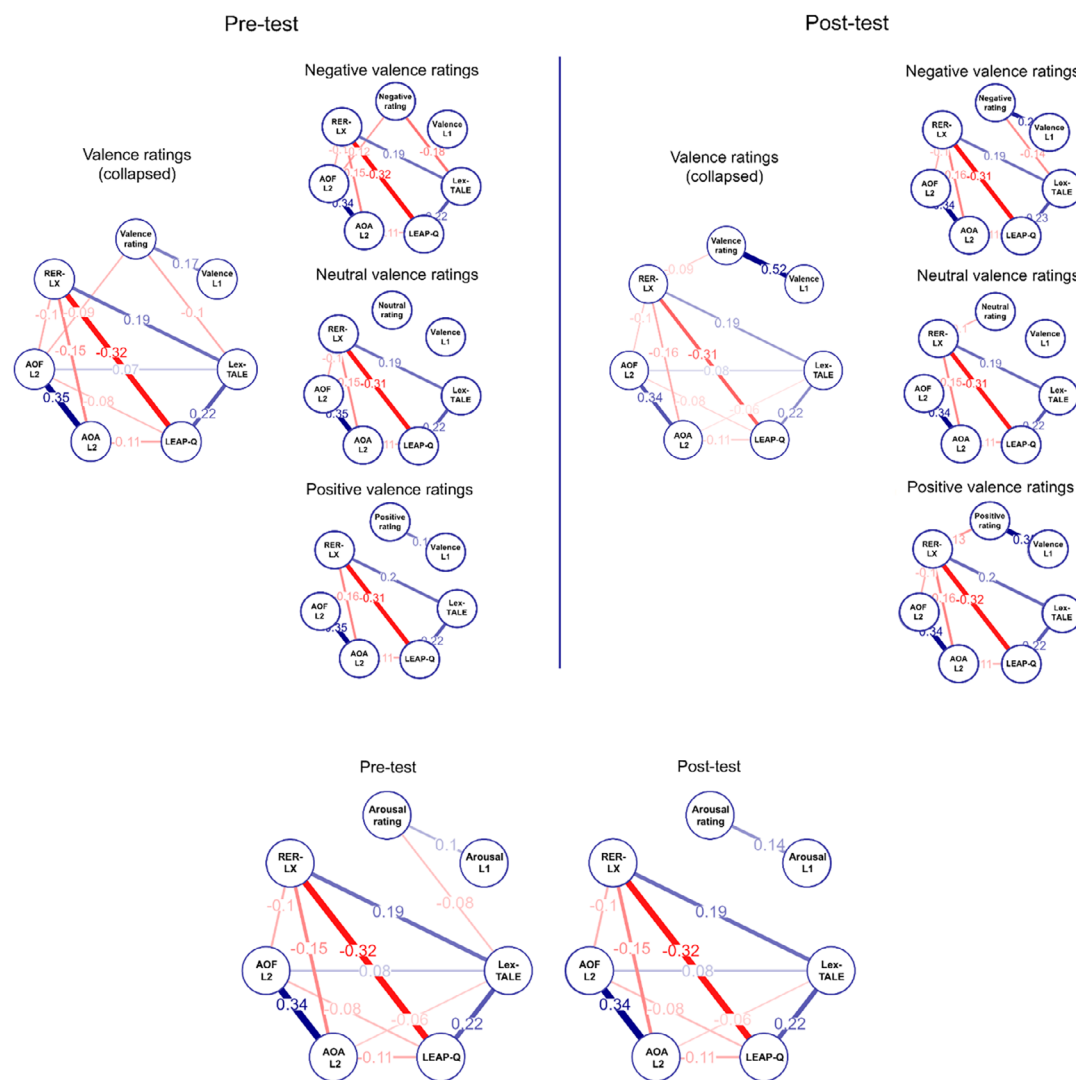
The weighted network also displays strong, negative correlations between LEAP-Q and RER-LX scores at both test sessions, indicating higher emotional resonance in L2 at higher levels of L2 competence. Other expected correlations were observed between L2 competence levels measured by means of LexTALE and LEAP-Q tests, as well as between age of L2 acquisition and age of L2 fluency, showing direct relationship at both test sessions.

### 3.3.2 | Arousal Ratings

The weighted network for arousal ratings of trained words showed only a weak association between EFL learners' and L1 speakers' arousal ratings, both before and after instruction (see Figure 2, bottom panel). Thus, unlike the increase observed in L1–L2 valence associations after instruction, the relationship between L1 and L2 arousal ratings showed only a minimal post-test increase, consistent with the absence of specific training effects for arousal. Correlations between arousal ratings and other L2 variables were particularly weak (all  $r$  lower than 0.1,  $p < 0.05$ ), indicating no meaningful associations.

## 4 | Discussion

The present study examined the effectiveness of an elaborative processing instructional method designed to enhance sensitivity to emotional vocabulary in a formal EFL learning context. We expected that the two instruction sessions would foster deeper learning of emotional vocabulary in L2 English and alter learners' affective evaluations of these words (valence and arousal ratings) after the training. We further hypothesized that this instruction would reduce the divergence observed between EFL learners and English L1 speakers in their emotional evaluations of such vocabulary. The findings supported these predictions: learners'



**FIGURE 2** | Weighted network for valence ratings (collapsed and across valence levels; upper panel) and arousal ratings (bottom panel) of trained words provided by EFL learners at pre-test and post-test instruction sessions. *Note:* Nodes represent the variables included in the model, with blue and red edge colors indicating the direction of the statistical relationship between variables (blue indicates direct and red indicates inverse relationship; note that RER-LX scores must be interpreted at reverse, as low scores imply high emotional resonance in L2). Numbers plotted in edges indicate the correlation between the pair of variables (only statistically significant correlations,  $p < 0.05$ , are shown). [Color figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.com)]

affective ratings of the trained words shifted across test sessions and became more closely aligned with L1 speaker responses following the instruction.

The instruction had its strongest effect on negative trained words, whose emotionality was modulated from relatively neutral ratings in the pre-test to markedly more negative valence ratings in the post-test. Conversely, no modulation was observed for positive or neutral words after the training. The less intense affective evaluation of negative emotional vocabulary in EFL before the instruction suggests that their representation is normally more disembodied and their use deficient in EFL, and therefore more susceptible of being enhanced through explicit instruction. This pattern of results is in line with previous findings on the reduced embodiment of negative L2 words (Ferré et al. 2022; Sheikh and Titone 2016; Tang et al. 2023), a tendency likely reinforced by the general positivity bias in language and human communication (Boucher and Osgood 1969; Dodds et al. 2015). Such positivity

bias in emotional communication has indeed been observed in EFL materials (Sánchez and Pérez-García 2020) and in the acquisition and use of emotional L2 vocabulary (Bustos López and Mavrou 2018; Pérez-García and Sánchez 2020; Sabater et al. 2023). Although some authors advocate using positive emotional materials to support vocabulary learning (Kralova et al. 2022; Turrero-García and Faber 2018), negative emotional contexts should be included as well to prevent the attenuation of negative language and foster more natural and nuanced communication in EFL. Crucially, our training reduced the positivity bias in learners' emotional processing: trained negative words were rated as less positive after instruction, aligning more closely with L1 speakers' affective norms (Warriner et al. 2013), as shown in both the regression and network analyses.

Importantly, the inclusion of both trained and non-trained words in our pre-/post-test design allowed us to disentangle the specific effects of the instruction in the evaluation of L2 emotional

vocabulary from those attributable to mere exposure. Thus, although the repeated exposure to this vocabulary across pre-/post-test sessions caused a slight modulation in the valence of non-trained words, only trained words—especially those with negative valence—exhibited a substantial change between sessions. This differential pattern indicates that the modulation observed cannot be explained solely by familiarity or repetition. Rather, the significant *training* × *valence* × *session* interaction supports the interpretation that the specifically targeted instruction improved the emotional evaluation of L2 words, beyond what would be expected from exposure alone.

Contrary to the valence dimension, arousal showed no instruction-related modulation across sessions in either the regression or the correlation-based network analyses. Although trained words elicited lower arousal than non-trained words, this effect was independent of test session, indicating that arousal differences remained stable before and after instruction. Thus, this pattern cannot be attributed to instructional effects or to semantic differences between stimuli, as trained and non-trained words were carefully matched on key psycholinguistic variables. More likely, this effect might be explained by difficulties in how arousal is characterized and measured, as well as understood and evaluated by participants. Researchers have often argued that arousal is a vague and inconsistent construct (Reid et al. 2024; Sander 2025; Smith et al. 2025). The range of terms used to describe it (i.e., intensity, activation, alertness, excitement, and so on) likely contributes to participants' confusion when evaluating words along this dimension. Such misunderstanding might also lead to scarce and ambiguous results, as in the present study, especially for behavioral and subjective measures that tend to show weaker reliability across participants. This lack of reliability is common in affective normative studies and contrasts with the consistent stability typically found in valence ratings (Muraki and Pexman 2025; Imbault et al. 2021; Warriner et al. 2013). These limitations in how arousal is defined, understood, and evaluated directly constrain the interpretation of our arousal results. This construct's unclear boundaries undermine its validity in capturing genuine emotional responses through subjective ratings, particularly considering the reduced sample and the absence of convergent and objective neurophysiological evidence in the present study. Future instruction studies could better assess arousal by using more sensitive and objective measures (e.g., physiological methods addressing changes in the autonomic response). In addition, our design held arousal constant across valence levels, which may have limited the detection of instruction-related arousal changes. Manipulating arousal across conditions in future work (i.e., including different levels of arousal across valences) could help uncover subtler instruction-driven effects.

Overall, the instruction proved to be an effective intervention for enhancing emotional processing in EFL, especially in shifting learners' valence evaluations toward native-like patterns. These results align with prior work showing the benefits of elaborative processing for L2 vocabulary learning (Kanazawa 2024; Lasekan et al. 2025; Sánchez et al. 2022). Our elaborative processing approach appears to support deeper integration and representation of new L2 words. The training combined comprehension and production tasks that engaged multiple processing levels (lexical, semantics, and emotional) across various sensory channels

(visual: reading and writing; auditory: oral comprehension and speech production; and motor: gestural and body expression), promoting active, multimodal elaboration. This blend of sensory, cognitive, and emotional processing fits well with multimodal learning principles, which likely facilitated a deeper integration by grounding concepts in multimodal (prior emotional) experiences. These results are also in line with previous studies showing that elaborative, multisensory instruction (visual, phonological, emotional, and motor) supports deeper processing of L2 vocabulary (Kamiya 2024). Although gestures and body movements are known to boost learning beyond simple exposure (Macedonia and Von Kriegstein 2012) and promote the acquisition of abstract words (Rodríguez-Cuadrado et al. 2022) and abstract grammatical concepts (Lopez-Ozieblo 2024), they have not previously been studied in the context of emotional vocabulary learning (De Stefani and De Marco 2019).

In terms of the relationship between valence ratings and participants' L2 variables, several weak but significant correlations were found. Participants' negative valence ratings correlated with their L2 competence level in both the pre-test and post-test, suggesting a modest but meaningful link between higher L2 lexical competence (LexTALE scores) and the valence of negative L2 words, that is, a more nuanced, native-like sensitivity to negative word meanings, which reduces the positivity bias often seen in EFL learners. A negative correlation also emerged between age of L2 fluency onset and pre-test valence ratings for negative words, with later-fluent speakers judging these words as more negative. This pattern may reflect differences in current L2 use and exposure, since learners who became fluent later might now engage more actively with the language, heightening their explicit awareness of emotional meanings. Interestingly, after the intervention, a significant negative correlation also appeared between RER-LX scores and valence ratings for positive words. Learners who were more emotionally attuned in their L2 (lower RER scores) rated positive words as more positive at post-test. This pattern suggests that higher emotional resonance supports sensitivity to positive meanings after the instruction, whereas L2 lexical competence and fluency seem more related to the processing of negative words. Nevertheless, these correlations should be interpreted cautiously. Aside from the robust post-instruction correlation between L1 and L2 emotional ratings—indicating the training effect in the emotional activation of L2 words—the remaining correlation effects are small, likely reflecting high individual variability and the multifaceted nature of L2 emotional processing, which is difficult to capture in a small sample. Future work should examine more directly how linguistic competence interacts with emotional and contextual factors, and how this interplay shifts through explicit instruction.

As a final remark, the lexical items used in the instruction were novel because they showed L1–L2 discrepancies in emotional evaluations (Bermúdez-Margaretto et al. 2025). Their careful selection, together with the pre-test/post-test design, allowed us to measure how the intervention reduced these differences. The vocabulary was also relatively advanced, mostly at the B2–C1 level, supporting more advanced L2 communication at both lexico-semantic and emotional levels.

Several limitations of this study should be noted regarding the stimuli, sample, and methodology. The small number of

lexical items included in the instruction (only 36 stimuli per training condition) is a key constraint. Although this size helped maintain experimental control and ensured the material was learnable, it likely reduced statistical power and generalizability. Future work should expand both the stimuli set and sample size to strengthen robustness and external validity. The sample was also small and predominantly female, which may limit generalization. Prior research suggests that women may use elaborative learning strategies more often (Waters and Schreiber 1991) and show gender-related differences in emotional processing (Reyes-Aguilar and Barrios 2016), indicating that more balanced samples are needed. Finally, the study did not assess whether emotional instruction improves broader L2 competence, socio-pragmatic communication, or long-term vocabulary retention. Future studies might explore whether the effect of this instruction extends beyond the emotional evaluation of L2 vocabulary, potentially enhancing learners' overall L2 competence, sociopragmatic awareness, and real-world communicative effectiveness. Longer-term, follow-up designs might be also considered to address the consolidation of the instructed materials as well as their transfer and generalization.

## 5 | Conclusion

Overall, this study offers new evidence that formal, elaborative instruction can enhance L2 emotional vocabulary in an EFL context. The materials and methodology produced clear effects on learners' emotional evaluations, most notably in the stronger negative ratings assigned to negative words. This shift helped reduce the gap between EFL learners and native speakers in how they interpret the emotional meaning of these items. The results support moving toward emotion-integrated vocabulary instruction and guide future interventions to include multimodal activities that engage learners with both positive and negative emotional vocabulary.

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### Conflicts of Interest

The authors declare no conflicts of interest.

### Endnotes

<sup>1</sup> In the present study, the terms emotional vocabulary/lexicon/words are used to refer to both emotion terms per se and emotion-laden words indistinctly (Pavlenko, 2008).

<sup>2</sup> The term additional language (LX), according to Dewaele (2018), is understood as any language (L2, L3, etc.) learnt after age three. In addition, any LX learnt in formal contexts in countries where it is not used as an official language is referred as foreign language (e.g., the case of English in Spain). The target LX examined in this study is the

participants' L2 English, learned as a foreign language (EFL). So, the terms L2 English or EFL are also used indistinctly here.

### References

- Abutalebi, J. 2008. "Neural Aspects of Second Language Representation and Language Control." *Acta Psychologica* 128, no. 3: 466–478. <https://doi.org/10.1016/j.actpsy.2008.03.014>.
- Aguilar, M., P. Ferré, and J. A. Hinojosa. 2024. "The Landscape of Emotional Language Processing in Bilinguals: A Review." *Psychology of Learning and Motivation* 80: 1–32. <https://doi.org/10.1016/bs.plm.2024.03.002>.
- Barsalou, L. W. 2008. "Grounded Cognition." *Annual Review of Psychology* 59: 617–645. <https://doi.org/10.1146/annurev.psych.59.103006.093639>.
- Baumeister, J. C., F. Foroni, M. Conrad, R. I. Rumiati, and P. Winkielman. 2017. "Embodiment and Emotional Memory in First vs. Second Language." *Frontiers in Psychology* 8: 394. <https://doi.org/10.3389/fpsyg.2017.00394>.
- Belardi, A., S. Pedrett, N. Rothen, and T. Reber. 2021. "Spacing, Feedback, and Testing Boost Vocabulary Learning." *Frontiers in Psychology* 12: 757262. <https://doi.org/10.3389/fpsyg.2021.757262>.
- Bermúdez-Margaretto, B., E. Pérez-García, A. Fernández, and M. J. Sánchez. 2025. *Emotion in Over 2,000 Words in English as a Foreign Language: Affective Ratings by College Student Learners*. [Unpublished manuscript]. Department of English, University of Salamanca.
- Blanco Canales, A., and E. Pérez-García. 2024. "Transfer of Affective Connotations in the Basic Lexicon of Spanish Learners of L2." *Revista De Lingüística y Lenguas Aplicadas* 19: 16–32. <https://doi.org/10.4995/rlyla.2024.20793>.
- Boucher, J., and C. E. Osgood. 1969. "The Pollyanna Hypothesis." *Journal of Verbal Learning & Verbal Behavior* 8, no. 1: 1–8. [https://doi.org/10.1016/S0022-5371\(69\)80002-2](https://doi.org/10.1016/S0022-5371(69)80002-2).
- Brybaert, M., A. B. Warriner, and V. Kuperman. 2014. "Concreteness Ratings for 40 Thousand Generally Known English Word Lemmas." *Behavior Research Methods* 46: 904–911. <https://doi.org/10.3758/s13428-013-0403-5>.
- Bustos López, F., and I. Mavrou. 2018. "Memoria y Emoción en el Aula de ELE: la enseñanza de Vocabulario emocional." In *Léxico y Cultura en LE/L2: Corpus y diccionarios*, edited by M. Bargalló Escrivá, E. Forgas Berdet, and A. Nomdedeu Rull, 117–127. ASELE.
- Caldwell-Harris, C. L., and A. Ayçiçeği-Dinn. 2009. "Emotion and Lying in a Non-Native Language." *International Journal of Psychophysiology* 71, no. 3: 193–204. <http://doi.org/10.1016/j.ijpsycho.2008.09.006>.
- Council of Europe. 2020. *Common European Framework of Reference for Languages: Learning, Teaching, Assessment—Companion Volume*. Council of Europe Publishing. [www.coe.int/lang-cefr](http://www.coe.int/lang-cefr).
- Degner, J., C. Doycheva, and D. Wentura. 2012. "It Matters How Much You Talk: On the Automaticity of Affective Connotations of First and Second Language Words." *Bilingualism: Language and Cognition* 15, no. 1: 181–189. <https://doi.org/10.1017/S1366728911000095>.
- De Stefani, E., and D. De Marco. 2019. "Language, Gesture, and Emotional Communication: An Embodied View of Social Interaction." *Frontiers in Psychology* 10: 1–8. <https://doi.org/10.3389/fpsyg.2019.02063>.
- Dewaele, J.-M. 2015. "On Emotions in Foreign Language Learning and Use." *The Language Teaching* 39, no. 3: 13–15. <https://doi.org/10.37546/JALTTL39.3-3>.
- Dewaele, J.-M. 2018. "Why the Dichotomy 'L1 versus LX User' is Better Than 'Native Versus Nonnative Speaker'." *Applied Linguistics* 39, no. 2: 236–240. <https://doi.org/10.1093/applin/amw055>.
- Dodds, P. S., E. M. Clark, S. Desu, et al. 2015. "Human Language Reveals a Universal Positivity Bias." *Proceedings of the National Academy of Sciences of the United States of America* 112, no. 8: 2389–2394. <https://doi.org/10.1073/pnas.1411678112>.

- Fan, L., Q. Xu, X. Wang, F. Zhang, Y. Yang, and X. Liu. 2016. "Neural Correlates of Task-Irrelevant First and Second Language Emotion Words—Evidence From the Emotional Face–Word Stroop Task." *Frontiers in Psychology* 7: 1672. <https://doi.org/10.3389/fpsyg.2016.01672>.
- Ferré, P., M. Guasch, H. Stadthagen-Gonzalez, and M. Comesaña. 2022. "Love Me in L1, but Hate Me in L2: How Native Speakers and Bilinguals Rate the Affectivity of Words When Feeling or Thinking About Them." *Bilingualism: Language and Cognition* 25, no. 5: 786–800. <https://doi.org/10.1017/S1366728922000189>.
- Fiorella, L. 2023. "Making Sense of Generative Learning." *Educational Psychology Review* 35, no. 2: 50.
- Fiorella, L., and R. E. Mayer. 2016. "Eight Ways to Promote Generative Learning." *Educational Psychology Review* 28, no. 4: 717–741. <https://doi.org/10.1007/s10648-015-9348-9>.
- Glenberg, A. M. 2008. "Embodiment for education." In *Handbook of Cognitive Science: An Embodied Approach*, edited by P. Calvo and T. Gomila, 355–372. Elsevier.
- Imbault, C., D. Titone, A. B. Warriner, and V. Kuperman. 2021. "How Are Words Felt in a Second Language: Norms for 2,628 English Words for Valence and Arousal by L2 Speakers." *Bilingualism: Language and Cognition* 24, no. 2: 281–292. <https://doi.org/10.1017/S1366728920000474>.
- JASP Team. 2023. *JASP (Version 0.17.1)* [Computer software]. <https://jasp-stats.org/>.
- Jończyk, R., B. Boutonnet, K. Musiał, K. Hoemann, and G. Thierry. 2016. "The Bilingual Brain Turns a Blind Eye to Negative Statements in the Second Language." *Cognitive, Affective, & Behavioral Neuroscience* 16: 527–540. <https://doi.org/10.3758/s13415-016-0411-x>.
- Kamiya, N. 2024. "Learners' Preferred L2 Vocabulary Learning Modalities." *Instructed Second Language Acquisition* 8, no. 1: 3–40. <https://doi.org/10.1558/isla.23874>.
- Kanazawa, Y. 2024. "Lexical and Contextual Emotional Valence in Foreign Language Vocabulary Retention: an Experimental Study and the Deep Epistemic Emotion Hypothesis." *The Mental Lexicon* 18, no. 3: 339–365. <https://doi.org/10.1075/ml.23001.kan>.
- Kralova, Z., J. Kamenicka, and A. Tirpakova. 2022. "Positive Emotional Stimuli in Teaching Foreign Language Vocabulary." *System* 104: 102678. <https://doi.org/10.1016/j.system.2021.102678>.
- Kühl, T., and A. Bertrams. 2019. "Is Learning With Elaborative Interrogation Less Desirable When Learners Are Depleted?" *Frontiers in Psychology* 10: 707. <https://doi.org/10.3389/fpsyg.2019.00707>.
- Lasekan, O., M. Godoy, and C. Méndez-Alarcón. 2025. "Integrating Emotional Vocabulary in EFL Education: A Model for Enhancing Emotional Intelligence in Pre-Service EFL Teachers." *Frontiers in Psychology* 15: 1508083. <https://doi.org/10.3389/fpsyg.2024.1508083>.
- Lemhöfer, K., and M. Broersma. 2012. "Introducing LexTALE: A Quick and Valid Lexical Test for Advanced Learners of English." *Behaviour Research Methods* 44, no. 2: 325–343. <https://doi.org/10.3758/s13428-011-0146-0>.
- Lopez-Ozieblo, R. 2024. "Effects of Pedagogical Gestures on Learning Abstract Grammatical Concepts in Young Adults." *Frontiers in Communication* 9: 1372033. <https://doi.org/10.3389/fcomm.2024.1372033>.
- Macedonia, M., and K. Von Kriegstein. 2012. "Gestures Enhance Foreign Language Learning." *Biolinguistics* 6, no. 3–4: 393–416. <https://hdl.handle.net/20.500.12528/1489>.
- Marian, V., H. K. Blumenfeld, and M. Kaushanskaya. 2007. "The Language Experience and Proficiency Questionnaire (LEAP-Q): Assessing Language Profiles in Bilinguals and Multilinguals." *Journal of Speech Language and Hearing Research* 50, no. 4: 940–967.
- Muraki, E. J., and P. M. Pexman. 2025. "English Verbs Semantic Norms Database: Concreteness, Embodiment, Imageability, Valence and Arousal Ratings for 3,500 Verbs." *Behavior Research Methods* 57, no. 5: 153. <https://doi.org/10.3758/s13428-025-02675-6>.
- Newman, M. 2010. *Networks: An Introduction*. Oxford University Press.
- Norman, T., and O. Peleg. 2022. "The Reduced Embodiment of a Second Language." *Bilingualism: Language and Cognition* 25, no. 3: 406–416. <https://doi.org/10.1017/S1366728921001115>.
- Opitz, B., and J. Degner. 2012. "Emotionality in a Second Language: It's a Matter of Time." *Neuropsychologia* 50, no. 8: 1961–1967. <https://doi.org/10.1016/j.neuropsychologia.2012.04.021>.
- Pavlenko, A. 2008. "Emotion and Emotion-Laden Words in the Bilingual Lexicon." *Bilingualism: Language and Cognition* 11, no. 2: 147–164. <https://doi.org/10.1017/S1366728908003283>.
- Pavlenko, A. 2012. "Affective Processing in Bilingual Speakers: Disembodied Cognition?" *International Journal of Psychology* 47, no. 6: 405–428. <https://doi.org/10.1080/00207594.2012.743665>.
- Pérez-García, E. 2025. *Multilingual Emotions. The Perception of Affective Information in Spanish and English. Iulma Monographs*. Publicacions de la Universitat de València. <https://omp.uv.es/index.php/PUV/catalog/book/497>.
- Pérez-García, E., and M. J. Sánchez. 2020. "Emotions as a Linguistic Category: Perception and Expression of Emotions by Spanish EFL Students." *Language, Culture and Curriculum* 33, no. 3: 274–289. <https://doi.org/10.1080/07908318.2019.1630422>.
- Ponari, M., S. Rodríguez-Cuadrado, D. Vinson, N. Fox, A. Costa, and G. Vigliocco. 2015. "Processing Advantage for Emotional Words in Bilingual Speakers." *Emotion* 15, no. 5: 644–652. <https://doi.org/10.1037/emo0000061>.
- Priawasana, E., N. S. Degeng, S. Utaya, and D. Kuswandi. 2020. "An Experimental Analysis on the Impact of Elaboration Learning on Learning Achievement and Critical Thinking." *Universal Journal of Educational Research* 8, no. 7: 3274–3279. <https://doi.org/10.13189/ujer.2020.080757>.
- Reid, T., C. Nielson, and J. B. Wormwood. 2024. "Measuring Arousal: Promises and Pitfalls." *Affective Science* 6, no. 2: 369–379. <https://doi.org/10.1007/s42761-024-00288-4>.
- Reyes Aguilar, A., and F. A. Barrios. 2016. "A Preliminary Study of Sex Differences in Emotional Experience." *Psychological Reports* 118, no. 2: 337–352. <https://doi.org/10.1177/0033294116633350>.
- Rodríguez-Cuadrado, S., F. Ojedo, F. Vicente-Conesa, C. Romero-Rivas, M. Á. C. Sampedro, and J. Santiago. 2022. "Sign Iconicity Helps Learning New Words for Abstract Concepts in a Foreign Language." *Second Language Research* 39, no. 3: 873–898. <https://doi.org/10.1177/02676583221093841>.
- Sabater, L., M. Ponari, J. Haro, et al. 2023. "The Acquisition of Emotion-Laden Words From Childhood to Adolescence." *Current Psychology* 42: 29280–29290. <https://doi.org/10.1007/s12144-022-03989-w>.
- Sánchez, M. J., M. Fernández, and E. Pérez-García. 2022. "Comparison of the Context Provision and Imagination Elicitation Approaches to Learning Emotional Vocabulary." *Language Teaching Research*. <https://doi.org/10.1177/13621688221131449>.
- Sánchez, M. J., and E. Pérez-García. 2020. "Emotion(less) Textbooks? An Investigation Into the Affective Lexical Content of EFL Textbooks." *System* 93: 102299. <https://doi.org/10.1016/j.system.2020.102299>.
- Sander, D. 2025. "Is 'Arousal' as a Scientific Concept, Worse Than Useless?" *Emotion Review* 17, no. 1: 19–22. <https://doi.org/10.1177/17540739241303501>.
- Segalowitz, N., P. Trofimovich, E. Gatbonton, and A. Sokolovskaya. 2008. "Feeling Affect in a Second Language: The Role of Word Recognition Automaticity." *The Mental Lexicon* 3, no. 1: 47–71. <https://doi.org/10.1075/ml.3.1.05seg>.
- Sharif, H., and S. Mahmood. 2023. "Emotional Processing in bilinguals: A Systematic Review Aimed at Identifying Future Trends in Neurolinguistics." *Humanities and Social Sciences Communication* 10: 438. <https://doi.org/10.1057/s41599-023-01926-1>.

Sheikh, N. A., and D. Titone. 2016. "The Embodiment of Emotional Words in a Second Language: An Eye-Movement Study." *Cognition and Emotion* 30, no. 3: 488–500. <https://doi.org/10.1080/02699931.2015.1018144>.

Smith, K. E., K. Woodard, and S. D. Pollak. 2025. "Arousal May Not be Anything to Get Excited About." *Emotion Review* 17, no. 1: 3–15. <https://doi.org/10.1177/17540739241303499>.

Sperling, R. A., C. M. Ramsay, P. M. Reeves, D. J. Follmer, and A. S. Richmond. 2016. "Supporting Students' Knowledge Construction and Self-Regulation Through the Use of Elaborative Processing Strategies." *Middle School Journal* 47, no. 3: 25–32. <https://doi.org/10.1080/00940771.2015.1135099>.

Sutton, T. M., J. Altarriba, J. L. Gianico, and D. M. Basnight-Brown. 2007. "The Automatic Access of Emotion: Emotional Stroop Effects in Spanish-English Bilingual Speakers." *Cognition and Emotion* 21, no. 5: 1077–1090. <http://doi.org/10.1080/02699930601054133>.

Tang, D., Y. Fu, H. Wang, B. Liu, A. Zang, and T. Kärkkäinen. 2023. "The Embodiment of Emotion-Label Words and Emotion-Laden Words: Evidence From Late Chinese–English Bilinguals." *Frontiers in Psychology* 14: 1143064. <http://doi.org/10.3389/fpsyg.2023.1143064>.

Tay, B. 2013. "Elaboration and Organization Strategies Used by Prospective Class Teachers While Studying Social Studies Education Textbooks." *Eurasian Journal of Educational Research* 13, no. 51: 229–252.

Toivo, W., and C. Scheepers. 2019. "Pupillary Responses to Affective Words in Bilinguals' First versus Second Language." *PLoS ONE* 14, no. 4: e0210450. <https://doi.org/10.1371/journal.pone.0210450>.

Toivo, W., C. Scheepers, and J.-M. Dewaele. 2024. "RER-LX: A New Scale to Measure Reduced Emotional Resonance in Bilinguals' Later Learnt Language." *Bilingualism: Language and Cognition* 27, no. 3: 434–446. <https://doi.org/10.1017/S1366728923000561>.

Turrero-García, M., and A. Faber. 2018. "The Effect of Emotional Affect in L2 Lexical Learning." *Revista Nebrija De Lingüística Aplicada a La Enseñanza De Lenguas* 12, no. 25: 96–118.

Van Heuven, W. J., P. Mandera, E. Keuleers, and M. Brysbaert. 2014. "SUBTLEX-UK: A New and Improved Word Frequency Database for British English." *Quarterly Journal of Experimental Psychology* 67, no. 6: 1176–1190. <https://doi.org/10.1080/17470218.2013.850521>.

Warriner, A. B., V. Kuperman, and M. Brysbaert. 2013. "Norms of Valence, Arousal, and Dominance for 13,915 English Lemmas." *Behavior Research Methods* 45: 1191–1207. <https://doi.org/10.3758/s13428-012-0314-x>.

Waters, H. S., and L. L. Schreiber. 1991. "Sex Differences in Elaborative Strategies: A Developmental Analysis." *Journal of Experimental Child Psychology* 52, no. 3: 319–335. [https://doi.org/10.1016/0022-0965\(91\)90066-2](https://doi.org/10.1016/0022-0965(91)90066-2).

Winkel, H. 2013. "The Emotional Stroop Task and Emotionality Rating of Negative and Neutral Words in Late Thai–English Bilinguals." *International Journal of Psychology* 48, no. 6: 1090–1098. <https://doi.org/10.1080/00207594.2013.793800>.

### Supporting Information

Additional supporting information can be found online in the Supporting Information section.

**Supporting File 1:** [ijal70064-sup-0001-SuppMat.docx](#)