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Enhancing Vocabulary Learning for Iranian EFL Learners: A Comparison of Laufer's Three 'I' Model and Expanded Five 'I' Model in Digital Contexts

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ABSTRACT

Objective: This study explored the impact of Laufer's three "I" model and its extended five "I" framework on Iranian EFL learners' vocabulary learning in a digital environment. In details, it examined the effects of these models on both incidental and intentional vocabulary learning, while also investigating learners' perceptions of the five "I" model.

Methods: A mixed-methods design was employed. Quantitative and qualitative data were collected from pre- and post-tests as well as semi-structured interviews. Sixty Iranian EFL learners were divided into experimental and control groups. ANOVA and Tukey HSD were conducted to assess learning outcomes.

Results: Results indicated no significant differences between instructional models in terms of incidental vocabulary learning. However, intentional vocabulary learning showed statistically significant improvement among learners exposed to the five "I" model, particularly those who engaged with the components of Input, Interaction, and Interpretation. Qualitative findings further revealed that learners viewed the five "I" model positively, citing increased motivation, reduced anxiety and greater confidence in vocabulary use.

Conclusions: The findings suggest that incidental vocabulary learning is less affected by instructional interventions, whereas intentional learning benefits from structured and interactive approaches. The progressive five "I" model appears to enhance learner engagement, autonomy, and affective factors in digitally mediated EFL contexts. Pedagogical implications for vocabulary instruction in digital environments are discussed.

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Introduction

For English as a Foreign Language (EFL) learners, vocabulary development is often described as one of the most demanding aspects of language learning. This area becomes even more complex in virtual learning environments. For Iranian EFL learners, vocabulary acquisition in digital contexts is particularly challenging due to limited technological infrastructure, reduced opportunities for real-time interaction, and the absence of paralinguistic cues that typically support comprehension in face-to-face instruction (Rahimi & Fathi, 2021). While vocabulary is fundamental in all major language skills, it is often difficult to be taught and learned effectively online. This difficulty is felt more in contexts like Iran, where virtual instruction is frequently hindered by factors such as limited infrastructure, reduced real-time interaction between teachers and students and often the absence of critical paralinguistic cues that normally aid comprehension in face-to-face instruction. As such, the challenge is not only pedagogical but also deeply rooted in logistical and contextual constraints specific to the Iranian EFL context (Akbari & Razavi, 2016).

The sudden shift to online education during the COVID-19 pandemic brought these challenges into sharper focus. What began as an emergency solution to sustain instruction (Bozkurt & Sharma, 2020; Murphy, 2020) soon evolved into a longer-term transformation of educational delivery models which prompt teachers and institutions to rethink how core language skills and systems should be approached in a digital context (Darling-Hammond & Hyler, 2020). For Iranian EFL educators, this shift has necessitated a reexamination of how to effectively deliver vocabulary instruction in digital settings, where the lack of spontaneity and real-time engagement poses significant barriers (Sadeghi & Richards, 2015). While learners have certainly benefited from greater flexibility in when and where they study, teachers have been left managing how to make vocabulary instruction work in settings that lack the spontaneity and real-time engagement of a physical classroom. This study focuses on addressing these specific challenges by proposing a framework tailored to enhance vocabulary learning for Iranian EFL learners in digital environments (Webb & Nation, 2017).

Although vocabulary learning has been a main focus in second language research, much of the literature tends to link it with reading comprehension. As a result, relatively little attention has been paid to models that account for vocabulary learning more holistically in digital contexts.

Laufer's (2017) well-cited three-"I" model—comprising *input*, *instruction*, and *involvement*—has provided a useful starting point for understanding vocabulary growth. However, when applied to online learning, particularly in resource-limited environments, this model shows clear limitations. It fails to fully address two components that are increasingly recognized as essential for vocabulary development in digital settings: *interaction* and *interpretation* (Teng, 2016; Staehr, 2009).

Relevant investigations have recently highlighted the importance of interactive and interpretive dimensions in vocabulary learning. In details, learners are not considered passive recipients of word knowledge; they need to be actively engaged with language through dialogic exchanges and contextual reasoning. For example, receptive and productive knowledge are constructed not only by input but also by learners' capacity to interpret meaning from context and apply it in real-life interactions. This becomes more significant in online learning where direct teacher support may be limited and learners must rely more heavily on peer collaboration and digital cues.

When thoughtfully integrated into instruction, digital technologies have the potential to enrich vocabulary learning by offering varied input formats and enhancing more active learner participation (Bonk, 2000; Chang, 2007). However, digital environments are uneven in their capacity to support sustained engagement, particularly regarding encouraging real-time interaction or deeper semantic interpretation. Research by Laufer and Paribakht (1998) highlighted learners' tendency to focus on passive vocabulary knowledge, yet such findings may not fully account for the sociocultural and technological variables at play in various EFL contexts, particularly in Asia and the Middle East.

In light of these gaps, the current study puts forward a revised model: the five-"I" framework, which supplements the original three components (*input*, *instruction*, and *involvement*) with *interaction* and *interpretation*. This expanded model is intended to offer a more comprehensive account of the processes that underpin vocabulary learning in digital settings. More specifically, this study explores the impact of both the original three-"I" model and the expanded five-"I" framework on Iranian EFL learners' vocabulary development, examining outcomes in both incidental and intentional learning contexts. This distinction is particularly important: incidental learning occurs as a byproduct of engaging in activities not directly focused on vocabulary acquisition, whereas intentional learning involves a conscious effort to study and retain new words.

The driving force behind this investigation is rooted not just in theoretical inquiry, but also in addressing real-world instructional needs. Teachers working in online contexts continue to struggle with identifying strategies that effectively support vocabulary development. By comparing two instructional models, the study aims to provide actionable insights into how digital platforms can be leveraged more effectively. Furthermore, it speaks to course designers and materials developers who are in search of frameworks that can guide the integration of meaningful vocabulary practice into online curricula.

Beyond its immediate implications for teaching practice, this research also contributes to ongoing theoretical discussions about the role of digital education in second language acquisition. By embedding interaction and interpretation within the model, the study captures the increasingly multimodal and collaborative nature of online learning. In doing so, it moves beyond a purely cognitive perspective and acknowledges the social and communicative dynamics that shape language development.

The findings are expected to hold value for a broad range of stakeholders. For teachers, the research may help identify effective techniques for online vocabulary instruction. For designers and developers, it offers a clearer framework for creating more engaging and pedagogically sound materials. For researchers, it opens new directions for investigating how different instructional elements influence learning outcomes across varied digital environments.

Ultimately, as English continues to gain global prominence and digital learning becomes an integral part of education systems worldwide, it is essential to revisit and refine the models that inform teaching practice. The five-“I” model proposed here represents an attempt to do just that—by grounding vocabulary instruction in both established theory and the evolving realities of EFL classrooms in the digital age.

The research objectives are as follows:

RO1. To compare the effects of Laufer’s three “I” model and the five “I” model on Iranian EFL learners’ incidental vocabulary learning in a digital environment.

RO2. To examine the effects of Laufer’s three “I” model versus the five “I” model on Iranian EFL learners’ intentional vocabulary learning in a digital context.

RO3. To explore how the five “I” model influences Iranian EFL learners’ perceptions toward vocabulary learning in online settings.

Literature Review

Second language (L2) vocabulary learning has recently observed a significant shift toward technology-enhanced and learner-centered approaches, driven by growing recognition of vocabulary's foundational role in language competence and academic success (Afzal, 2019; Suteja, 2020). The diverse body of literature reflects a multi-dimensional understanding of vocabulary learning, including instructional design, digital tools, learner engagement, and theoretical frameworks.

Incidental learning of vocabulary through digital environments is one of the most prominent themes across studies. Lee (2023) highlighted the potential of digital games in promoting incidental learning, emphasizing that conscious attention and fluency development are critical in sustaining vocabulary retention. Complementary findings by Yanagisawa and Webb (2021) and Namaziandost et al. (2020) expanded on this by applying the Involvement Load Hypothesis (ILH), offering predictive models that consider cognitive engagement levels across tasks. Similarly, audiovisual input, especially through multimedia materials such as TV programs, has proven particularly effective in enhancing incidental learning (Teng, 2023; Feng & Webb, 2019; Karami, 2019), with researchers noting that such input can offer rich contextualization and repeated exposure, essential for retention and deeper lexical processing.

Alongside input-based approaches, output and interaction-based strategies have shown considerable promise. Studies rooted in sociocultural theory (Ahmadian & Tajabadi, 2017; Noroozi & Mehrdad, 2016) highlighted how peer interaction, collaborative tasks, and expert-novice dynamics support vocabulary acquisition by scaffolding learners' development within their zones of proximal development. Markova (2016) extended this to early childhood contexts, showing that structured classroom engagement fosters more frequent English vocabulary use than unstructured play.

Technological tools continue to redefine the context of vocabulary instruction. Digital tools, such as mobile apps and platforms like Instagram, address specific EFL challenges, including limited exposure to authentic language and low learner motivation, by offering contextualized, interactive, and engaging input (Beyranvand & Rahmatollahi, 2021). For instance, multimedia elements in apps facilitate repeated exposure and meaning-focused input, supporting Krashen's (1985) input hypothesis, while gamified features foster interaction and collaborative learning, resonating with

Vygotsky's (1978) sociocultural theory. These tools mitigate EFL classroom constraints by enabling personalized learning paths and real-time feedback, though their effectiveness depends on intentional instructional design to ensure productive vocabulary use and transfer to real-world contexts (Wang et al., 2021). Meta-analyses and reviews (e.g., Hao et al., 2021) revealed that mobile apps, when designed with multimedia elements, gamified rewards, and learner-responsive features, can significantly enhance vocabulary outcomes. Mobile-supported learning, particularly outside traditional classroom boundaries, has also been positively received by learners (Klimova & Polkova, 2020; Miyazaki, 2019), although concerns remain about these tools' ability to promote productive and contextualized language use. Beyranvand and Rahmatollahi (2021), for instance, examined platforms like Instagram and Adobe Connect in ESP settings, highlighting their efficacy in teaching technical vocabulary while also pointing to the importance of instructional design in maximizing their impact.

The five "I" model proposed in this study builds on Laufer's (2017) three "I" model (input, instruction, involvement) by incorporating interaction and interpretation, addressing specific limitations identified in prior critiques (Teng, 2016; Staehr, 2009). Unlike Nation's (2007) Four Strands framework, which emphasizes a balanced approach across meaning-focused input, meaning-focused output, language-focused learning, and fluency development, the five "I" model specifically targets the dynamic interplay of cognitive and social processes in digital vocabulary learning. While the Four Strands provide a broad pedagogical guideline, they do not explicitly account for the interpretive processes learners undertake when navigating digital cues or the real-time interaction facilitated by online platforms. Similarly, Hu and Nassaji's (2016) Technique Feature Analysis (TFA) focuses on task-specific features that influence lexical engagement, such as evaluation and depth of processing. However, TFA is less concerned with the sociocultural dimensions of learning, which the five "I" model prioritizes through its interaction component, aligning with Vygotsky's (1978) sociocultural theory.

The addition of interaction addresses a key limitation of the three "I" model, as highlighted by Teng (2016), who noted that Laufer's framework underemphasizes the role of collaborative dialogue in vocabulary retention. Interaction, as conceptualized here, encompasses peer-to-peer and learner-content exchanges in digital environments, fostering opportunities for negotiation of meaning and scaffolding, as supported by sociocultural theory (Ahmadian & Tajabadi, 2017).

Interpretation, on the other hand, responds to Staehr's (2009) critique that the three "I" model overlooks learners' active construction of meaning from contextual and multimodal cues, particularly in digital settings where paralinguistic cues are limited. By integrating interpretation, the five "I" model acknowledges learners' cognitive efforts to decode and internalize vocabulary through digital texts, visuals, and interactive tasks, aligning with findings from multimedia learning studies (Teng, 2023).

Compared to the Involvement Load Hypothesis (ILH), which quantifies cognitive engagement through need, search, and evaluation (Laufer & Hulstijn, 2001), the five "I" model offers a more holistic framework by embedding interaction and interpretation as distinct yet complementary processes. While ILH focuses on task-induced involvement, it does not explicitly address the social and technological affordances of digital platforms, such as synchronous communication tools or gamified apps, which are central to the five "I" model. By situating itself at the intersection of cognitive, social, and technological dimensions, the proposed model advances SLA theory by offering a framework tailored to the complexities of online EFL contexts, particularly in resource-constrained settings like Iran.

Before moving to the review of the empirical studies, it is necessary to elaborate on five Is in the proposed model. The proposed five "I" model builds on Laufer's (2017) three "I" model, which emphasizes input (exposure to language), instruction (explicit teaching), and involvement (cognitive engagement with tasks). However, as Teng (2016) and Staehr (2009) critiqued, this model does not fully capture the social and interpretive processes central to digital learning environments. To address these gaps, the five "I" model incorporates interaction and interpretation, grounding them in established SLA theories.

1. Input: Rooted in Krashen's (1985) Input Hypothesis, input refers to comprehensible language exposure through reading, listening, or multimedia. In digital contexts, varied input formats (e.g., videos, interactive texts) enhance incidental learning (Teng, 2023).

2. Instruction: Aligned with cognitive load theory (Robinson, 2001), instruction involves explicit teaching strategies that structure vocabulary learning, reducing extraneous cognitive load in online settings (Kaivanpanah et al., 2020).

3. Involvement: Drawing on the ILH (Laufer & Hulstijn, 2001), involvement reflects learners' cognitive engagement through tasks requiring need, search, and evaluation, with moderate involvement loads optimizing retention (Webb et al., 2020).

4. Interaction: Grounded in Long's (1996) Interaction Hypothesis, interaction emphasizes collaborative dialogue and negotiation of meaning, fostering vocabulary acquisition through peer-to-peer and learner-content exchanges in digital platforms (Ahmadian & Tajabadi, 2017). This component addresses Teng's (2016) critique that the three "I" model overlooks social scaffolding in virtual settings.

5. Interpretation: Anchored in constructivist principles (Piaget, 1970; Vygotsky, 1978), interpretation refers to learners' active construction of meaning from contextual and multimodal cues. This process is critical in digital environments where paralinguistic cues are limited, requiring learners to decode vocabulary through texts, visuals, and tasks (Staehr, 2009; Teng, 2023).

Together, these components address the pedagogical and contextual challenges of Iranian EFL settings, where limited infrastructure and reduced real-time interaction necessitate innovative approaches. The five "I" model thus offers a theoretically grounded framework that integrates cognitive engagement, social interaction, and interpretive processes, paving the way for effective vocabulary instruction in digital contexts.

Blended and online learning models have also gained attention. Alipour (2021) reported no significant difference between online and blended methods, though both enhanced vocabulary learning outcomes. Similarly, Huang (2016) and Çelikbaş (2018) found that combining synchronous platforms (e.g., Adobe Connect) with traditional formats fostered greater learner engagement and speaking confidence. Studies such as Pouria and Behabadi (2023) and Cheung (2021) emphasized how learners' perception and interactional competence evolve in synchronous online environments, suggesting a need to redefine classroom dynamics in digital contexts.

Vocabulary feedback and assessment are crucial and often underexplored aspects of vocabulary development. Alzubi et al. (2021) and Brown (2016) addressed the role of oral corrective feedback in online settings, identifying variables, such as teacher experience and feedback type, that influence effectiveness. Rassaei (2015) further added that learners' emotional states, particularly anxiety levels, mediate the benefits of recasts and metalinguistic feedback.

From a pedagogical design perspective, task characteristics significantly influence vocabulary outcomes. Kaivanpanah et al. (2020) and Webb et al. (2020) found that both input- and output-oriented tasks with moderate involvement loads led to vocabulary gains, though diminishing returns were noted at higher involvement levels. Hu and Nassaji (2015) offered a compelling critique of the ILH by advocating for Technique Feature Analysis (TFA), a framework that accounts for the quality and range of lexical engagement beyond involvement alone.

Other instructional innovations such as Total Physical Response (TPR) (Sumarni et al., 2022) and LMS-based vocabulary learning (Lyashenkoa & Malinina, 2015; Sari et al., 2019) demonstrated how embodied learning and structured digital environments can yield lasting effects when integrated meaningfully. The former taps into kinesthetic memory through action-based instruction, while the latter supports sustained engagement through modular content delivery and tracking features.

Several studies focused on the need for personalization and strategy training. Ghalebi et al. (2020) argued that EFL learners' preferred vocabulary strategies should be considered when designing curricula, as one-size-fits-all models often fall short. Likewise, Tang and Treffers-Daller (2016) highlighted typological challenges in vocabulary acquisition, noting that interventions must be tailored to learners' linguistic backgrounds.

Finally, early vocabulary development and discipline-specific vocabulary have been given special attention. Malaa et al. (2019) and Son et al. (2023) illustrated how vocabulary instruction embedded in extensive reading or content-specific materials (like science storybooks) significantly benefits young learners' lexical knowledge and literacy skills. Bahrani et al. (2014) reminded of the fundamental SLA principle that not all input becomes intake, reinforcing the importance of structured exposure and meaningful processing.

Collectively, these studies point to a growing consensus: effective vocabulary acquisition in EFL contexts is no longer confined to rote memorization or isolated practice. Instead, it flourishes through multimodal input, interactive scaffolding, strategic task design, and responsive digital tools that place learners at the center. As the field continues to evolve, a more integrated and learner-sensitive approach is vital for fostering deep, transferable lexical knowledge across diverse educational settings.

Material and Methods

Research Design

This study employed a mixed-methods design, combining both quantitative and qualitative methodologies. Quantitative and qualitative data were collected from pre- and post-tests as well as semi-structured interviews.

Participants

The study was conducted with 60 intermediate-level male EFL learners, aged 16 to 20. The participants were selected based on convenience sampling method from three private language institutes in Tehran, Iran. Initially, 93 learners took the Oxford Quick Placement Test (OQPT), but only those whose scores fell within one standard deviation of the mean were chosen to ensure proficiency homogeneity. All participants were native Persian speakers learning English as a foreign language. Participants in intact classes were randomly and manually assigned to two groups: (1) Experimental Group: Received vocabulary instruction using the five "I" model through an online platform. (2) Control Group: Received instruction following Laufer's traditional three "I" model. To maximize consistency in instruction, both groups were taught by the same teacher using identical materials. Moreover, two experienced raters, each holding a PhD in TEFL and having over ten years of teaching experience, were involved in scoring and reviewing the research instruments to enhance the reliability of the procedures.

Table 1. Demographic Background of the Participants

Number of Participants	93
Gender	Male
Age	16-20
Native Language	Persian
Target Language	English
Proficiency Level	Intermediate

To protect the rights of participants, who were minors ages, informed consent was obtained from both the learners and their parents, and strict measures were implemented to ensure privacy and anonymity throughout the study.

Instruments and Materials

Oxford Quick Placement Test (OQPT): To determine the participants' general English proficiency, the OQPT (Allen, 2004) was administered. Comprising 60 items, focusing on

grammar, reading, and vocabulary, the test offers a reliable means of selecting a homogeneous sample (r = 0.77). Its familiarity to learners minimized test anxiety and contributed to scoring reliability.

Vocabulary Pretest and Posttest: Two parallel vocabulary tests were used to measure both incidental and intentional vocabulary learning. The tests consisted of 30 multiple-choice items derived from authentic texts in the Active Reading series. The pretest was administered before the intervention to establish a baseline, while the posttest, although containing the same content, was reorganized to mitigate memorization effects. The reliability of the tests was confirmed using the KR-12 method (pretest r = 0.75; posttest r = 0.71), and their validity was examined by two expert reviewers. The vocabulary pretest and posttest, each comprising 30 multiple-choice items, were developed to assess both incidental and intentional vocabulary learning, with items systematically derived from the Oxford Word Skills series (A2 to C1 levels) used in the intervention. To ensure content validity, the test items were carefully mapped to the instructional materials' vocabulary content and the study's learning objectives, which focused on enhancing learners' recognition and application of target words in context. This alignment process involved selecting items that reflected the lexical range and contextual usage presented in the Active Reading series texts, ensuring relevance to both the three "I" and five "I" instructional models. Two expert reviewers in English language teaching further evaluated the tests to confirm their alignment with the intended constructs and instructional goals.

Active Reading Book: Both groups used selected texts from the Oxford Word Skills series, which spans levels A2 to C1. These texts were chosen for their rich vocabulary input and suitability for both self-directed and instructor-led learning tasks.

Semi-Structured Interview: To investigate learners' perceptions of vocabulary learning in digital contexts, specifically under the five "I" model, a semi-structured interview was conducted with 10 voluntary participants from the experimental group. The reason for choosing 10 persons from among 30 participants of the treatment group was the saturation and voluntary participation. Furthermore, after analyzing the results of quantitative data, the findings revealed that the experimental group outperformed the control group, hence just the interview was used for the participants of that group. The final interview protocol, consisting of 10 open-ended questions, was validated by three TEFL experts. Interviews were conducted in person, recorded with consent,

and transcribed for qualitative analysis. This component added depth to the study by exploring the perceived effectiveness of interaction and interpretation in online learning.

Data Collection

The research followed a quasi-experimental, pretest-posttest control group design within a sequential explanatory mixed-methods framework (Dörnyei, 2007). Following a brief pilot study with a comparable group of learners to test instrument clarity and timing, the main data collection began. This study received ethical approval from the Institutional Review Board at the Tehran Branch, Islamic Azad University, and all participants provided informed consent prior to participation. To ensure data privacy, particularly for the semi-structured interview recordings and transcripts conducted in the digital context, several measures were implemented following guidelines for ethical research in digital environments. Audio recordings were conducted via a secure, password-protected Zoom platform with end-to-end encryption, and files were immediately transferred to an encrypted, university-provided server accessible only to the research team. Transcripts were anonymized by assigning pseudonyms to participants, and all identifiable information was removed during transcription to protect confidentiality. Digital data were stored in compliance with data protection regulations, and access was restricted to authorized researchers, with files scheduled for deletion five years post-study, aligning with standard research protocols. These measures ensured the privacy and security of participants' data throughout the research process. Participants in the experimental group received instruction based on the five "I" model, input, instruction, involvement, interaction, and interpretation, delivered over eight weeks through digital platforms. Learning activities included teacher-led mini-lessons, independent reading, self-monitoring tasks, peer discussions, and digital scaffolding. Meanwhile, the control group followed a traditional classroom approach based on Laufer's three "I" model (input, instruction, and involvement). Both groups engaged with the same instructional materials to control for content exposure. The digital platform utilized for the experimental group's delivery of the five "I" model (Input, Instruction, Involvement, Interaction, Interpretation) was Zoom, an open-source learning management system widely recognized for its flexibility in language learning contexts. The platform facilitated teacher-led mini-lessons through pre-recorded video lectures and interactive slideshows, enabling asynchronous access to instructional content. Independent reading tasks were supported by embedded e-texts from the Oxford Word Skills series, with integrated annotation

tools for self-monitoring. Peer discussions were conducted via Zoom's discussion forums, which allowed threaded conversations to foster collaborative learning and interaction. Additionally, digital scaffolding was provided through multimedia resources, such as vocabulary quizzes with immediate feedback and interactive glossaries, designed to enhance learner engagement and interpretation for technology-enhanced language learning. These features ensured structured delivery of the intervention while supporting replicability in similar EFL contexts. After the treatment, a vocabulary posttest was administered to both groups. To triangulate the findings, semi-structured interviews were also conducted with a subset of the experimental group.

Data Analysis

We analyzed quantitative data through both descriptive and inferential statistical methods. Initially, mean scores and standard deviations were calculated for the pretest and posttest to establish baseline performance and examine learning outcomes later. Skewness and Kurtosis Values and Levene's Test were conducted to assess the normality of the data distribution. To determine whether the five "I" model had a statistically significant impact on incidental and intentional vocabulary learning compared to the traditional three "I" framework, a one-way ANOVA was employed. Test reliability was evaluated using the KR-12. In the qualitative phase, interview transcripts were subjected to theme-based coding in order to identify the recurring and key themes.

Results

Reliability Indices of the Research Instruments

Before the main study was conducted, the reliability of the research instruments was evaluated through a pilot study. A group of 15 EFL learners, who shared similar demographic and educational characteristics with the primary participants, was randomly selected for this purpose. The pilot testing helped ensure that the vocabulary assessments were both consistent and suitable for the target population. As presented in Table 2, the reliability coefficients of both the pretest and posttest were acceptable, indicating a satisfactory level of internal consistency for the instruments used.

Table 2. Reliability Indexes of the Tests in the Study

Test	IItems	Index
Vocabulary Pretest	30	.75
Vocabulary Posttest	30	.71

As illustrated in Table 3, the participants' scores on the Oxford Placement Test (OPT) ranged from 32 to 55, with a mean of 37.5 and a standard deviation of 1.708. Drawing on these results, 60 learners were randomly selected from the larger pool of 93 to ensure a relatively homogenous level of language proficiency. These selected participants were then assigned to two equal groups (N = 30): one designated as the experimental group and the other as the control group.

Table 3. Mean and standard deviation of OPT scores (n = 93)

	N	Min	Max	M	SD
OPT	93	32	55	37.5	1.708

As shown in Table 4, the experimental group's vocabulary scores improved from a pretest mean of 18.00 (SD = 1.706) to a posttest mean of 21.50 (SD = 1.031) which suggests a significant development following the intervention. In contrast, the control group showed relatively stable performance, with a pretest mean of 18.50 (SD = 1.706) and a posttest mean of 18.32 (SD = 1.031). These results point to a potential effect of the instructional treatment applied in the experimental group.

Table 4. The Descriptive Analysis of Experimental Group

		N	Min.	Max.	M	SD.
Experimental Group	Pretest	30	18	23	18.00	1.706
	Posttest	30	17	27	21.50	1.031
Control group	Pretest	30	19	26	18.50	1.706
	Posttest	30	21	25	18.32	1.031

Normality Distribution of Data Set

In line with Field's (2013) guidelines for conducting parametric statistical analyses, four key assumptions were considered, including normality of data distribution, homogeneity of variances, use of interval-level variables, and independence of observations. To assess the first assumption which was normality, skewness and kurtosis values were calculated for both the experimental and control groups. As shown in Table 5, for the experimental group, the skewness z-score was approximately -0.34, and the kurtosis z-score was -0.83. Similarly, for the control group, the skewness z-score was around 0.53, and the kurtosis z-score was -1.23. Since none of these z-scores exceeded the critical value of ±1.96 ($p < .05$), the distributions for both groups can be considered approximately normal.

Table 5. Skewness and Kurtosis Values

	Skewness	Std. Error of Skewness	Kurtosis	Std. Error of Kurtosis
Experimental	-.112	.328	-.624	.749
Control	.165	.314	-.759	.616

To evaluate the second assumption, homogeneity of variances, Levene's test was conducted. The results are shown in Table 6. Since the significance values for all conditions were above 0.05, the results suggest that the assumption of equal variances across groups is met. In other words, there were no statistically significant differences in variance between the control and experimental groups. Since the main assumptions of the parametric test were met, ANOVA was conducted.

Table 6. Levene's Test Results.

	Levene Statistic	df1	df2	Sig.
Based on Mean	.084	1	58	.722
Based on Median	.078	1	58	.719
Based on Median and with adjusted df	.078	1	53.02	.719
Based on trimmed mean	.082	1	118	.720

Research Objective 1: Effects of the Three "I" and Five "I" Models on Incidental Vocabulary Learning

The first research objective aimed to examine whether there was a statistically significant difference between Laufer's original three "I" model and the proposed five "I" model in enhancing Iranian EFL learners' incidental vocabulary learning in a digital learning environment. To address this objective, a one-way Analysis of Variance (ANOVA) was conducted. As shown in Table 7, the ANOVA revealed no statistically significant difference among the groups, $F(4, 56) = 0.768$, $p = .517$. This suggests that, contrary to expectations, the implementation of the five "I" model did not lead to a significantly greater improvement in incidental vocabulary learning compared to the original three "I" model or other conditions under examination. Although a Tukey HSD post hoc test was planned to locate specific group differences, the non-significant ANOVA result indicates that such follow-up comparisons are unlikely to yield meaningful insights. Nevertheless, the Tukey test was conducted for completeness.

Table 7. ANOVA Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	306.050	4	102.017	.768	.517
Within Groups	7438.533	56	132.831		
Total	7744.583	60			

To examine potential differences in incidental vocabulary learning among the instructional models, a Tukey HSD post hoc test was conducted following the ANOVA. However, in line with the ANOVA findings, the post hoc comparisons did not yield any statistically significant differences between the groups. As can be seen in Table 8, all pairwise comparisons among the instructional conditions produced p-values above the conventional threshold of .05. Moreover, none of the 95% confidence intervals for the group comparisons excluded zero which reinforced the conclusion that there were no meaningful differences in incidental vocabulary learning across the instructional models. Therefore, the combined results of the ANOVA and Tukey HSD test suggest that neither Laufer's original three "I" model nor the proposed five "I" model led to significantly different outcomes in learners' incidental vocabulary development in this digital learning context.

Table 8. Tukey HSD for Incidental Vocabulary Learning

(a) Group	(b) Model	Mean Difference (a-b)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Input	Instruction	4.40000	4.20842	.724	-6.7434	15.5434
	Involvement	.000000	4.20842	.725	-5.8433	14.3671
	Interaction	4.40000	4.20842	.677	-3.7655	11.7432
	Interpretation	.000000	4.20842	.643	-4.7433	10.3221
	CG	-1.40000	4.20842	.987	-12.5434	9.7434
Instruction	Input	4.40000	4.45781	.518	-5.3434	16.9434
	Involvement	.000000	4.45781	.766	-4.3221	7.4301
	Interaction	3.045668	4.45781	.714	-3.0854	13.6541
	Interpretation	4.667821	4.45781	.732	-2.9755	15.4397
	CG	-4.06667	4.20842	.769	-7.0768	15.2101
Involvement	Input	.000000	4.87727	.632	-6.0532	14.3671
	Instruction	.000000	4.87727	.616	-4.7655	11.7432
	Interaction	3.766322	4.87727	.608	-5.9765	10.3221
	Interpretation	4.000321	4.87727	.628	-4.0881	9.5543
	CG	-4.655421	4.87727	.618	-5.7543	12.8768
Interaction	Input	4.400030	4.67723	.732	-4.0064	8.4768
	Instruction	4.000002	4.87727	.754	-4.0655	14.3671
	Involvement	.000000	4.87727	.633	-3.7554	11.7432
	Interpretation	4.000004	4.87727	.705	-5.0952	10.3221
	CG	-3.455202	4.87727	.342	-7.8431	9.3218
Interpretation	Input	4.655211	4.00943	.634	-11.754	12.8768
	Instruction	4.667821	4.00943	.678	-7.7321	8.4768
	Involvement	4.000321	4.00943	.648	-4.732	7.0093
	Interaction	4.000004	4.00943	.697	-5.0083	8.8342
	CG	-3.56621	4.00943	.686	-5.0051	11.4532
CG	Input	-1.40000	4.37842	.351	-9.4101	12.8768
	Instruction	-4.06667	4.37842	.344	-13.8101	8.4768
	Involvement	-4.655421	4.37842	.365	-9.6543	10.5432
	Interaction	-3.455202	4.37842	.357	-7.6433	14.8544
	Interpretation	-3.56621	4.37842	.375	-6.0094	9.5432

Research Objective 2: Effects of the Three "I" and Five "I" Models on Intentional Vocabulary Learning

The second research objective focused on examining whether Laufer's original three "I" model and the extended five "I" model had significantly different effects on Iranian EFL learners' intentional vocabulary learning in a digital context. As indicated in Table 9, the ANOVA revealed a statistically significant difference among the instructional groups, $F(4, 56) = 8.402$, $p = .003$. This finding indicates that the type of instructional model, whether based on Laufer's three "I" or five "I" framework, had a meaningful effect on learners' intentional vocabulary learning in the digital learning context. To determine which specific group differences accounted for this effect, a Tukey HSD post hoc test was conducted.

Table 9. ANOVA Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	106.133	4	132.067	8.402	.003
Within Groups	520.850	56	90.962		
Total	606.983	60			

To identify where the statistically significant differences in intentional vocabulary learning occurred, a Tukey HSD post hoc test was performed following the ANOVA. As shown in Table 10, several pairwise comparisons revealed meaningful differences between the instructional models. Specifically, learners in the Input group significantly outperformed those in the Instruction, Involvement, and Control groups, with mean differences of 2.90, 3.00, and 3.00 respectively, all at $p < .01$. Similarly, the Interaction group showed significantly higher scores compared to the same three groups, with consistent mean differences in the same range ($p < .01$). In addition, the Interpretation group significantly outperformed the Control group ($p = .009$), although its differences with other experimental groups did not reach statistical significance. Importantly, none of the confidence intervals for these significant comparisons included zero which shows the robustness of the findings. These results suggest that instructional conditions incorporating Input, Interaction, and Interpretation which are core components of the five "I" model were more effective in supporting intentional vocabulary learning compared to the more limited structure of the original three "I" model.

Table 10. Tukey HSD for Intentional Vocabulary Learning

(a) Group	(b) Model	Mean Difference (a-b)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Input	Instruction	-2.900*	.723	.009	-5.18	-.62
	Involvement	-3.000*	.947	.007	-5.28	-.72
	Interaction	2.900*	.928	.009	.62	5.18
	Interpretation	-.100	.922	.994	-2.38	2.18
	CG	3.000*	.002	.007	.72	5.28
Instruction	Input	.100	.917	.994	-2.18	2.38
	Involvement	-2.900*	.843	.009	-5.18	-.62
	Interaction	-3.000*	.275	.007	-5.28	-.72
	Interpretation	2.900*	.561	.009	.62	5.18
	CG	-.100	.007	.007	-2.38	2.18
Involvement	Input	3.000*	.843	.007	.72	5.28
	Instruction	.100	.285	.994	-2.18	2.38
	Interaction	-2.900*	.366	.009	-5.18	-.62
	Interpretation	-3.000*	.743	.007	-5.28	-.72
	CG	2.900*	.004	.009	.62	5.18
Interaction	Input	-.100	.832	.994	-2.38	2.18
	Instruction	3.000*	.743	.007	.72	5.28
	Involvement	.100	.344	.994	-2.18	2.38
	Interpretation	-2.900*	.588	.009	-5.18	-.62
	CG	-3.000*	.006	.007	-5.28	-.72
Interpretation	Input	2.900*	.943	.009	.62	5.18
	Instruction	-.100	.743	.994	-2.38	2.18
	Involvement	3.000*	.821	.007	.72	5.28
	Interaction	.100	.557	.994	-2.18	2.38
	CG	-2.900*	.422	.009	-5.18	-.62
CG	Input	-3.000*	.005	.007	-5.28	-.72
	Instruction	-2.900*	.006	.009	.62	5.18
	Involvement	-1.100	.244	.004	-2.38	2.18
	Interaction	-3.000*	.002	.007	.72	5.28
	Interpretation	-1.100	.005	.004	-2.18	2.38

Research Objective 3: Learners' Perceptions of the Five "I" Model

The third research objective aimed to explore how the transformation of Laufer's five "I" model influenced Iranian EFL learners' perceptions of vocabulary learning in a digital environment. To address this question, qualitative data gathered through semi-structured interviews were analyzed thematically. The qualitative data from semi-structured interviews with 10 participants from the experimental group, exploring perceptions of the five "I" model (Input, Instruction, Involvement, Interaction, Interpretation), were analyzed using thematic analysis following Braun and Clarke's (2006) six-phase framework. Initial codes were generated through open coding of interview transcripts, focusing on recurring patterns related to learners' experiences, such as emotional responses and perceived learning benefits. For example, codes like "reduced anxiety" and "contextual application" emerged from excerpts such as, "The five 'I' reduced my anxiety and boosted my enjoyment" (Participant 3) and "I could relate words to real-life situations better"

(Participant 7). These codes were grouped into themes, including “increased enjoyment,” “learner autonomy,” and “practical knowledge of real-world language use,” through iterative comparison and refinement. To ensure credibility, inter-rater reliability was established by having two independent coders review 30% of the transcripts, achieving a Cohen’s kappa coefficient of 0.82, indicating strong agreement. Themes were finalized after consensus discussions, ensuring robust representation of participants’ perspectives. This rigorous process strengthens the validity of the findings.

Participants generally responded positively to the five “I” model, with many highlighting its potential as a sustainable learning strategy. One participant reflected:

(1) "I will probably consider using Laufer’s five ‘I’ model as a vocabulary learning strategy if I become a teacher someday. Interpretation, for instance, helps highlight how declarative vocabulary knowledge depends on explicit learning processes, especially during the early stages. These are more noticeable in explicit learning groups. On the other hand, acquiring vocabulary skills often relies on implicit processes, which happen unconsciously and are more present in less explicit learning settings."

Other learners emphasized how the five “I” model promoted meaningful engagement in digital contexts:

(2) "I think five ‘I’ may foster our engagement through extended practice. It’s especially useful in digital environments where we could benefit from teacher feedback, longer participation periods, and opportunities for interaction beyond the classroom."

Several participants also pointed out the psychological and motivational benefits associated with this model. One interviewee shared:

(3) "The five ‘I’ reduced my anxiety and boosted my enjoyment, motivation, and sense of achievement. I started to develop more positive attitudes, interest, and stronger language learning values after using this model."

In addition to emotional and cognitive benefits, many learners noted that the five “I” helped them apply vocabulary knowledge to real-life contexts. They reported being better able to relate classroom learning to daily life, navigate textbook content more confidently, and respond more effectively to vocabulary-related questions.

Overall the interviews suggest that transforming the five “I” into a more dynamic and context-sensitive model helped learners' perceptions of vocabulary learning and made it more meaningful and relevant. The thematic analysis revealed the following key categories:

- Increased enjoyment and interest in learning
- Gaining practical knowledge of real-world language use
- A deeper appreciation for how words function in various contexts
- Making vocabulary learning more accessible and manageable
- Encouraging more active student involvement
- Adding variety to the learning process
- Raising learners’ language awareness
- Promoting enjoyment during learning
- Enhancing learner autonomy

Discussion

This study set out to explore how Laufer’s three “I” model and the expanded five “I” model influence vocabulary learning among Iranian EFL learners in a digital environment. It focused on two distinct learning types, including incidental and intentional, and also examined how learners perceived the five “I” model as part of their online learning experience. The findings offer a clearer understanding of how these instructional models operate differently depending on the nature of vocabulary learning, while also highlighting the added value of the five “I” from the learners' own perspectives.

Concerning the first research objective, the results showed that there was no significant difference in incidental vocabulary learning between the groups taught using the three “I” and the five “I” models. Both the ANOVA and Tukey HSD analyses showed that adding components like Interpretation and Interaction did not lead to significant development of learners’ incidental vocabulary. These findings can show that incidental vocabulary learning which is often unconscious and context-dependent is less likely to be influenced by instructional design alone, especially in digital settings where attention and engagement levels may fluctuate. These results support Gu’s (2003) argument that incidental learning relies largely on implicit memory and is not

always responsive to intentional instructional input. The finding that the five "I" model did not significantly improve incidental vocabulary learning, unlike intentional learning, warrants further exploration. This lack of significance may be attributed to several factors, including the limited eight-week exposure time, which may have been insufficient for incidental learning to occur, as it relies heavily on implicit processes requiring extended and repeated exposure to lexical items (Hulstijn, 2003). Additionally, the digital platform's interactive elements, such as discussion forums and multimedia quizzes, may have introduced distractions that shifted learners' focus from implicit vocabulary acquisition to more explicit, task-oriented engagement, Future research should investigate longer intervention periods and refine task designs to minimize digital distractions while fostering conditions conducive to implicit vocabulary acquisition, thereby aligning with theoretical expectations for incidental learning.

While the findings suggest that the five "I" model (Input, Instruction, Involvement, Interaction, Interpretation) enhances intentional vocabulary learning in a digital context, the claim of its broad applicability across diverse digital learning environments should be approached cautiously due to the study's specific context and methodological limitations. The sample, consisting of 60 male learners from private institutes in Tehran, may not fully represent other EFL populations, such as mixed-gender groups or learners in rural or public settings. Additionally, the use of Zoom as the sole digital platform limits generalizability, as other platforms with varying features (e.g., gamified interfaces or synchronous tools) may yield different results.

The second research objective, however, told a different story. The data revealed significant differences among the instructional groups concerning intentional vocabulary learning. Learners who experienced the five "I" model, particularly those exposed to the Input, Interaction, and Interpretation elements, performed better than those in the three "I" model or the control group. This suggests that intentional learning, which involves focused attention and deliberate effort, benefits from richer instructional frameworks that encourage engagement, interaction, and deeper cognitive processing. These results support the claims of Laufer and Hulstijn (2001), who argued that vocabulary learning is enhanced when the involvement load is higher, as it is in more interactive and cognitively demanding tasks. They also confirm the idea that intentional vocabulary study is more effective when both explicit teaching and meaningful use are integrated into the learning experience.

The third research objective addressed how learners perceived the impact of the five "I" model on vocabulary learning in a digital environment. Thematic analysis of interview data indicated overwhelmingly positive attitudes toward the model. Learners reported increased motivation, reduced anxiety, greater enjoyment, and stronger engagement. They also appreciated the opportunity to apply vocabulary knowledge in real-life contexts and valued the variety and autonomy introduced through the five "I" approach. These findings echo those of Brewster and Fager (2019), who emphasized the motivational and cognitive benefits of incorporating interaction and interpretation into vocabulary instruction. In line with constructivist theory (Vygotsky, 1978; Lee & Smagorinsky, 2000), learners' experiences suggest that the digital learning environment, when paired with a dynamic instructional model like the five "I," can facilitate deeper knowledge construction through interaction, scaffolding, and collaborative engagement. The model allowed learners to personalize their learning, make sense of vocabulary in authentic contexts, and take more ownership of their progress, qualities that are especially important in remote or digitally mediated instruction.

Quantitatively, the experimental group demonstrated significant gains in intentional vocabulary learning ($p < .05$, as shown in ANOVA/Tukey HSD results), aligning with the qualitative findings where participants reported heightened motivation and enjoyment, such as, "The five 'I' reduced my anxiety and boosted my enjoyment, motivation, and sense of achievement" (Participant 3). This suggests that the motivational benefits of the five "I" model, particularly through interactive and interpretive tasks on the Zoom platform, fostered deeper engagement with explicit vocabulary learning processes, as supported by Dörnyei and Ushioda's (2011) framework on motivation in language learning. Specifically, the model's emphasis on interaction and interpretation likely enhanced learners' task-induced involvement, a key factor in intentional learning (Laufer & Hulstijn, 2001), by creating a dynamic, learner-centered environment that encouraged active participation.

Finally, it is worth noting that while the study indeed foregrounded learners' positive perceptions of the five "I" model, it also addressed the critical distinction between perception and measurable learning outcomes. Specifically, the analysis revealed that although participants reported increased motivation, enjoyment, and real-world application, these subjective benefits aligned with quantitative findings showing significant gains in intentional vocabulary learning ($p < .05$), thus

reinforcing a link between perception and outcome. Nonetheless, the study acknowledges potential biases in self-reported data and the possible influence of novelty—limitations explicitly discussed in relation to the study's short duration, small and context-specific sample, and reliance on a single platform (Zoom). Future research was recommended to evaluate long-term effects and minimize novelty bias by extending the intervention period and diversifying learner populations and digital tools. Hence, while the learners' enthusiasm was evident, it was not uncritically accepted as evidence of efficacy; rather, it was triangulated with statistical outcomes and interpreted within the scope of both motivational theory and methodological constraints. To strengthen the qualitative findings, future research could complement interviews with longitudinal qualitative data, such as reflective journals or focus groups conducted over extended periods, to assess the durability of learners' perceptions. Triangulating these with quantitative measures, like vocabulary retention tests, could clarify whether positive perceptions correlate with actual learning outcomes. Additionally, comparing the five "I" model to established methods in a controlled setting could isolate the novelty effect, while techniques like member checking could further mitigate bias in self-reported data, enhancing the validity of conclusions about the model's impact.

Conclusion

This study attempted to explore how Laufer's three "I" model and the expanded five "I" model influence vocabulary learning among Iranian EFL students in a digital setting. It focused on two key aspects of vocabulary development, incidental and intentional learning, and also looked into how learners themselves perceived the impact of the five "I" model on their experiences. The first research objective asked whether incidental vocabulary learning could be improved by using the five "I" model, which extends the original three "I" framework by incorporating Interaction and Interpretation. The findings showed no significant differences among the groups, suggesting that incidental learning which typically happens without direct focus on vocabulary is less affected by instructional design, especially in digital classrooms where maintaining learner engagement can be more challenging.

The second objective painted a different picture. When it came to intentional vocabulary learning, the differences between instructional models were clear. Learners exposed to the five "I" model, particularly those engaged with Input, Interaction, and Interpretation, performed noticeably better than their peers. These results point to the power of structured and interactive tasks which can

encourage active participation. When learners are purposefully guided and have the chance to process and apply new vocabulary, they are more likely to retain it and use it effectively. Finally, the third objective addressed learners' perceptions about the five "I" model. The interviews showed that students felt more motivated, less anxious and more confident in using vocabulary out of the classroom. They appreciated the model's variety, adaptability and relevance to real-life communication which are considered qualities that made vocabulary learning feel more meaningful in an online environment. These insights suggest that the five "I" model can meet with the expectations and needs of today's digitally connected language learners.

All results considered; the findings highlight the importance of instructional design in shaping the effectiveness of vocabulary learning strategies. While incidental learning may depend more on exposure and less on structure, intentional learning clearly benefits from a layered, interactive approach. Furthermore, learners' positive perceptions of the five "I" model suggest that digital instruction can be both effective and engaging when built on a foundation of interaction, interpretation, and learner autonomy. These outcomes support theories of cognitive load (e.g., Robinson, 2001), affective engagement (Fredrickson, 2001), and dynamic systems theory (Dolcos et al., 2011), which collectively argue that attention, emotion, and motivation are closely interrelated in the learning process. Vocabulary development is not merely a matter of exposure or memorization; it is constructed by the interaction of cognitive effort, emotional experience, and instructional support. Finally, the study supports the value of digital contexts for vocabulary development. Effective use of technology can enhance behavioral and cognitive engagement in addition to its potential to help learners interact with vocabulary in ways that are more meaningful. However, teachers are recommended to consider that that engagement alone does not necessarily lead to learning. Structured guidance, recycling strategies, and differentiated support are essential to ensure that learners not only enjoy the process but also make measurable gains in their lexical knowledge.

Implications

Theoretically, the five "I" model contributes to SLA research by extending Laufer's three "I" framework (Input, Instruction, Involvement) to include interaction and interpretation, aligning with interactionist theories that emphasize social and cognitive engagement in language acquisition (Gass & Mackey, 2007). The significant improvement in intentional vocabulary

learning suggests that the added components enhance task-induced involvement load (Laufer & Hulstijn, 2001), offering a framework for future SLA studies to explore how interactive and interpretive tasks mediate explicit learning processes in digital contexts. The lack of significant gains in incidental learning highlights the need for further theoretical exploration of implicit learning mechanisms in technology-enhanced environments. The findings of this study offer several practical takeaways for educators, curriculum developers, and learners involved in digital language education. For educational systems that aim to boost learner engagement, incorporating Laufer's three "I" model and its extended five "I" version into digital instruction offers a practical and effective framework. These models promote active participation and cognitive investment, both of which are essential for meaningful vocabulary learning, whether incidental or intentional. Task designers are encouraged to develop learning activities that stimulate active participation and are adapted to learners' cognitive strengths. Designing tasks that involve interaction, interpretation, and meaningful input can help learners process vocabulary more deeply and retain it more effectively. Similarly, materials developers should consider embedding these principles into textbooks, apps, and online resources. Materials that fail to engage learners risk limiting cognitive involvement, which in turn can reduce learning outcomes.

EFL/ESL teachers may also benefit from adopting a more facilitative role in the classroom. Rather than serving solely as sources of information, teachers should guide learners in managing tasks independently, encouraging autonomy and exploration. Laufer's models support this shift by providing a clear structure that promotes both learner responsibility and active use of language. Regarding learners, they should be encouraged to reconsider their role in the classroom from passive recipients of vocabulary lists to active participants in their own learning. The classroom, especially in a digital context, can become a space for guided discovery where vocabulary is discovered through meaningful engagement.

Additionally, this study highlights the relevance of Laufer's models for teachers who may be cautious to implement motivation-based instruction. The five "I" model, in particular, offers motivation, autonomy, and learner-centered practices. Given that motivational factors are often nonlinear and vary widely among individuals, teachers should avoid one-size-fits-all approaches. Instead, they should use diverse digital tools and adaptive strategies that meet learners' unique emotional and cognitive needs. Finally, course designers and material developers can extend the

impact of these findings beyond the classroom. By monitoring student interactions and offering timely support, whether through peer feedback or teacher guidance, they can create a more collaborative and responsive learning environment which can reinforce vocabulary development and enhance a sense of shared responsibility for learning which is especially valuable in online settings.

In addressing the generalizability concerns, this study acknowledges the limitations posed by its sample of 60 male learners from private language institutes in Tehran. The gender-specific sample may limit the applicability of the findings, as male learners could exhibit distinct motivational and learning patterns compared to mixed-gender or female-only groups, as noted by Dörnyei (2001) in his work on gender influences in language learning motivation. To enhance the generalizability of future research, it is recommended that studies incorporate diverse samples, including female learners and varied institutional contexts, to better reflect the global diversity of EFL learners. Finally, SLA research should examine how the five "I" model informs theoretical constructs like the involvement load hypothesis, particularly by quantifying the contributions of interaction and interpretation to vocabulary acquisition in digital settings.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by ethics committee of Tehran Branch, Islamic Azad University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

A. M., and M IA, and N. Fr. contributed to the study conception and design, material preparation, data collection and analysis. All authors contributed to the article and approved the submitted version.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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