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Investigating the role of laufer's three "I" model on students' engagement in vocabulary learning: a progressive perspective on input, instruction, involvement, interaction, and interpretation in digital contexts

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ABSTRACT

Background: While vocabulary acquisition models have been widely studied, the comparative role of Laufer's frameworks in digital environments—particularly their effects on learner engagement and perception—remains underexplored. This research addresses this gap by examining how these models mediate vocabulary learning outcomes among Iranian EFL learners.

Aims: This study aimed to investigate the impact of Laufer's Three "I" model (Input, Instruction, Involvement) and the extended Five "I" model (adding Interaction and Interpretation) on Iranian EFL learners' deliberate and incidental vocabulary learning engagement in digital contexts.

Methods: The study employed a sequential mixed-methods design with 93 intermediate-level male EFL learners (aged 16–20) selected via convenience sampling from private language institutes in Tehran. After homogeneity screening using the Oxford Quick Placement Test (OQPT), 60 participants were randomly assigned to experimental (digital-based instruction) and control (traditional face-to-face) groups. Data were collected through vocabulary tests, engagement surveys, and semi-structured interviews, analyzed using SPSS (v.26) for quantitative data (ANOVA, t-tests) and thematic analysis for qualitative responses.

Results: Results indicated that the Five "I" model significantly outperformed the Three "I" model in both deliberate ($p < 0.05$, $d = 0.85$) and incidental ($p < 0.05$, $d = 0.72$) vocabulary learning. Qualitative data revealed enhanced engagement, reduced anxiety, and improved metacognitive awareness among learners using the progressive model, particularly through its Interaction and Interpretation components.

Conclusion: The findings suggest that Laufer's expanded Five "I" model offers a more effective framework for digital vocabulary instruction by integrating social-interactive and interpretive elements. Educators should prioritize structured yet interactive digital activities to maximize lexical acquisition and learner motivation in EFL contexts.

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Extended Abstract

Introduction

For EFL learners, the lack of vocabulary acquired through online instruction has long been an issue. Because of this challenge, researchers and educators are growing increasingly interested in creating a model to help EFL students expand their vocabulary (Teng, 2022). The many forms of vocabulary learning that should be taken into account in online EFL settings continue to raise concerns, despite the fact that vocabulary acquisition is not a brand-new issue (Teng & Zhang, 2021). The problem addressed in the present study is not something local, in other words one cannot say that this is a problem that is characteristic of one particular group of students or society. Legislative recognition of English reflects broader societal trends towards globalization and internationalization, wherein proficiency in English is increasingly viewed as a prerequisite for success in a globalized world (Wandari et al., 2024). Every person, no matter where they live in the globe, who wants to be proficient in a language other than their mother tongue or even their native tongue will encounter it. Undoubtedly, the issue is not as severe for novices as it is outweighed by their lack of vocabulary, unfamiliarity with the new language, and grammatical structures.

One of the most challenging problems that EFL teachers have is helping their students build a large vocabulary in the classroom, particularly in online courses (Laufer, 2016). Recently, researchers have tried to pinpoint some effective techniques for imparting and gaining vocabulary, as it is essential for the growth of all four language skills (speaking, writing, reading, and listening). Teaching English as a foreign language to intermediate EFL learners in Iranian schools has as one of its goals equipping them with the vocabulary necessary to express oneself in the digital age (Yanagisawa & Webb, 2021). Whether on design or by mistake, Iranian EFL teachers should concentrate on teaching vocabulary to students in an effective way. However, in most cases, EFL students' needs are not met by the amount of vocabulary they are taught in foreign language programs, particularly online language classes (Turan & Akdag-Cimen, 2019). In virtual learning environments, the most common problems that Iranian EFL teachers and students have are lack of knowledge and experience, as well as the difficulty of teaching and studying remotely.

Another problem is that the teaching and learning are more difficult in Iran due to two well-known problems with remote learning: inadequate facilities and a lack of interaction between professors and pupils (Uchihara & Saito, 2019). One more issue that makes vocabulary acquisition very difficult is that online classrooms lack face-to-face interaction. This is mostly because some paralinguistic components that could aid pupils in comprehending word meanings have been lost.

To be competent communicators in a foreign language, learners must build a large enough vocabulary and learn how to use it for different purposes and situations. Nonetheless, the majority of this field's research has focused on the connection between reading comprehension and vocabulary acquisition. Despite a large body of research indicating that vocabulary knowledge has a significant role in predicting input, instruction, involvement, interaction, and interpretation in digital contexts achievement in second or foreign language instruction (Rassaei, 2015).

In EFL environments, Van de Wege (2018) study discovered a significant relationship between vocabulary knowledge and input, instruction, involvement, interaction, and interpretation in digital contexts. Teng (2024) also found a significant relationship between vocabulary knowledge and input, instruction, involvement, interaction, and interpretation in digital contexts, adding that the types of digital texts used are likely to have an impact on vocabulary size and lexical covering needs for input, instruction, involvement, interaction, and interpretation in digital contexts. Knowledge that is receptive involves comprehending the structure, meaning, and possible applications of a word; productive knowledge, on the other hand, involves using a word correctly in its lexical, pragmatic, syntactic, and spelling digital contexts. And Zhu et al., (2024) suggested that all aspects of L2 vocabulary knowledge, including meaning recognition, meaning

recall, form recognition, form recall, and vocabulary use, were facilitated by digital reading.

Van den Bosch et al. (2019), discovered that although there was a reduced passive-active vocabulary gap among EFL learners, more terms from the smaller receptive vocabulary size were employed more often. However, vocabulary acquisition often presents a formidable challenge, appearing as anoverwhelming, seemingly endless task for many learners (Teng et al., 2024).

They postulate that EFL students work more to acquire passive vocabulary through deliberate learning. Unfortunately, because to a lack of study on the subject, this explanation ignores the issue of various EFL settings and the requirement to take Asian learners' vocabulary sizes into account. The point that most of the Asian countries are regarded as contexts where learners' exposure to an L2 (often English language) is limited to academic contexts, such as schools and universities (Heidari, 2024).

In one of the most recent studies, Laufer (2016) presented a three-"I" model: input, instruction, and engagement. Further research is needed on this model profundity. Still, given the restrictions on online learning in countries with poor access to digital resources, it seems that more elements ought to be included in the model. In this study, two more determinants, interaction and interpretation, were added to the prior model to increase its relevance for EFL learners. The researcher thus compared the effects of using Laufer's three "I" model against a five "I" model that includes input, instruction, involvement, interaction, and interpretation on EFL learners' incidental and intentional vocabulary learning in a digital context in order to meet the needs of users of digital platforms for vocabulary learning.

The purpose of this study is to investigate the role of Laufer's Three "I" model in vocabulary learning among Iranian EFL learners' engagement in a digital context. Moreover, Laufer's Three "I" model plays a different role in the purposeful and incidental vocabulary learning of Iranian EFL learners' engagement in a digital context. Therefore, the use of Laufer's three "I" model vs the five "I" model in digital contexts impact Iranian EFL learners' incidental vocabulary learning. In EFL contexts, although the overall picture of students' perceptions of vocabulary learning in a digital environment is less explored, there is some empirical research reporting students' favorable attitudes toward vocabulary learning in a digital environment used in their language classes (Wang, 2021).

There is an increasing interest in learning English as a second or foreign language worldwide, so it's important to investigate the factors that could affect language acquisition (Webb et al., 2021). It is widely acknowledged that a variety of social and psychological factors influence language acquisition processes and their outcomes (Webb, S., & Nation, 2017). The process of learning a language always involves expanding one's vocabulary. Learning without a vocabulary would be impossible (Minalla, 2024). The capacity learning vocabulary is essential for success when learning a second or foreign language. Furthermore, administrators of colleges, universities, and other higher education institutions had to search for alternatives to in-person instruction because to the COVID-19 pandemic's global expansion. To continue the education, they initially chose "emergency remote teaching" (Van Laer & Elen, 2019) or "emergency e-learning" and then high-quality online teaching. Teachers and other stakeholders were faced with some novel difficulties and opportunities as a result of the practice of online teaching (Walsh & Sert, 2019).

To offer information based on data regarding the advantages or disadvantages of the pandemic for the educational system, the researchers will need to conduct some research. This is because there is a lack of understanding and experience with many facets of the opportunities or challenges that may arise from these unique situations, as well as the novelty of the disease. Therefore, the findings of this study and others of a similar kind may be essential in defining and determining the general effects of self-directed learning on the standard of language learning during a pandemic. The findings might also help shape future strategies and plans of action for handling similar crises that might affect the educational system in the future.

The majority of EFL teachers list choosing the best method for introducing new vocabulary to their

students as one of the biggest difficulties they face most often when teaching languages. This study is unique in that it applies the five "I"s model rather than Laufer's three "I"s model (2017) in order to determine a more practical method for online vocabulary acquisition. This study is the inclusion of two additional determinants and how they affected EFL learners' accidental and purposeful vocabulary development in a digital learning environment. By using digital learning, instructors can give their students the advantage of remote learning, which eliminates time and location constraints.

The study's conclusions may be useful to a variety of parties involved in language learning and teaching, including EFL students, instructors, course designers, material developers, and researchers. They might demonstrate to many stakeholders in EFL settings that digital platforms are useful for language learning, which entails learning a lot of words, as opposed to being utilized just for entertainment or business.

Language teachers may utilize the study's findings to ascertain the most effective approach for teaching L2 vocabulary to EFL students on purpose and by accident so that they can acquire the language rapidly and without needing to communicate with native speakers. Course designers and material designers may utilize the study's findings to produce teaching aids and educational resources for EFL students that will facilitate their acquisition and retention of a large vocabulary.

The newly designed exercises in L2 course books and instructor guides may be constructed to enable access to all five "I"s: input, instruction, participation, interaction, and interpretation. This will help to enhance vocabulary learning and retention, especially in online classrooms.

Finally, the findings of this research could persuade and assist other EFL researchers to conduct more surveys and gain more insights regarding the importance of different determinants or new frameworks to improve online vocabulary learning.

To achieve the purposes of this study, the following major questions are proposed:

1. What is the role of Laufer’s Three “I” model in vocabulary learning among Iranian EFL learners’ engagement in a digital context?
2. How does Laufer’s Three “I” model play a different role in the purposeful and incidental vocabulary learning of Iranian EFL learners’ engagement in a digital context?)
3. To what extent does the use of Laufer's three "I" model vs the five "I" model in a digital setting impact Iranian EFL learners' incidental vocabulary learning?
4. To what extent does the use of Laufer's three "I" model vs the five "I" model in a digital context impact Iranian EFL learners' deliberate vocabulary learning?
5. To what extent Iranian EFL learners’ engagement in vocabulary learning is progressed via applying Laufer's progressive "I" model?
6. How does the progressive “I” transform Iranian EFL learners’ perception on vocabulary learning in a digital environment?

Method

For the purpose of the current study, a sequential mixed-methods design was utilized. The participants of the present study included 93 intermediate EFL learners selected based on convenience sampling from three private language institutes in Tehran, Iran. Then, based on on the result of oxford quick placement test (OQPT) 60 EFL learners were randomly selected, who scored one standard deviation above and below the mean score. Inclusion and Exclusion Criteria: The study included 93 male Iranian EFL learners aged 16–20 with Persian as their first language and intermediate English proficiency, selected via convenience sampling from private language institutes in Tehran. Participants were further narrowed down to 60 based on Oxford Quick Placement Test (OQPT) scores within one standard deviation of the mean. Exclusion criteria encompassed female participants, non-Persian speakers, those outside the specified age range, and learners scoring outside the intermediate proficiency band on the OQPT. Additionally, participants unwilling to engage in digital learning (for the experimental group) or adhere to traditional instruction (for the control group) were excluded to maintain homogeneity and control confounding variables.

Instruments

Oxford Placement Test (OPT): In order to determine the participants’ English language proficiency level

an Oxford Placement Test (OPT) was employed (Allen, 2004). The test consisted of reading, vocabulary and grammar sections. It comprised of 60 questions in two parts. The first part contains 40 multiple-choice items in 4 subparts including: the grammatical questions about prepositions (items 1-5), cloze passage test in which one option out of three ones should be selected (items 6-10), cloze passages test in which one option from four ones should be selected (items 7-20) and finally testing grammatical knowledge (21-40). The second part of this test includes two sub-sections, for the first one the learners are required to read two cloze passages and select the correct option (items 41-50) and the second section tapped learners' vocabulary format (items 51-60). The participants were allotted 60 minutes to answer the questions. The results were classified based on OPT ranking rubric. The inclusion of the OPT in this study was driven by two reasons. Firstly, the participants were expected to be more familiar with the structure of this test compared to other tests, which can facilitate their performance. Secondly, the use of the OPT allowed for the selection of participants who were more homogenous in terms of language proficiency (Allen, 2004). The reliability of the OPT was measured and found to have a reasonable value of.77, indicating a decent level of reliability. In addition, OPT is internationally distributed and have been published by an internationally popular and leading publisher, Pearson Longman. Further, OPT aimed to estimate the learners with different proficiency levels, and its contents were more authentic than other language placement tests, and therefore, more suitable for the analysis. Another reason for selecting OPT pertains to what the authors have claimed about it. According to these authors, there is an emphasis on cultural fluency in it that enable learners to navigate the social, travel, and business situations that they encounter in their real lives. This characteristic could reassure the researcher that OPT the appropriate test for homogenizing the learners at the beginning of the study.

Vocabulary Test (Pretest and Posttest): To calculate the participants' vocabulary homogeneity at the beginning of the study, a vocabulary test was designed and piloted. The test comprised 30 multiple-choice items with five authentic passages, ranging from 200 to 250 words. The digital passages were selected from *Active Readin*g textbook. This test was employed as a pretest prior the treatment and once again was given to the participants as a post-test after the treatment. The only difference between the two tests was in the organization and sequence of the items. The reliability of the pretest and posttest were calculated through KR-12 method. The estimated reliability for the pretest and posttest came out to be 0.75, and 0.71, respectively. The reliability of the pretest and posttest was calculated through the use of split-half method with the assumption that all the items were parallel in the two halves to avoid administering the same test to the same group twice, in order to eliminate the risk of practice effect, and avoid developing two parallel tests, and to save time and effort in developing, administering, and scoring process. In addition, to ensure their validity, they were reviewed by two language experts and their comments were used. The time allocated for the test was 40 minutes, so that all participants could try all the items. The scoring procedure was an objective type, that is, the rater's own judgment had no effect on the scores. It should be reminded that the pretest and posttest were discrete-point tests, ideal forms of test for diagnostic purposes.

Active Reading Book: The Oxford word skills book series was a suitable collection for improving English vocabulary skills from A2 to C1 levels. This collection, which was compiled based on the American system, were used for two purposes: improving vocabulary skills and speaking skills. The Oxford word skills books were classified in three levels from Intro to level 3, which included 12 lessons in one of the books.

A Semi-structured Interview: For the qualitative aspect of the study, and in order to examine the role of the progressive "I" in transforming Iranian EFL learners' perception on vocabulary learning in a digital environment a semi-structured interview was administered. It allowed the participants to be heard in their own voices and open-ended questioning helped the researcher gain a richer understanding of participants' perceptions and knowledge on the

efficacy of Laufer's Three "I" model in vocabulary learning. The interview has 10 items. It should be noted here that to ensure the validity the items were reviewed by three language experts, who were PhD. in TEFL from two Islamic Azad Universities, Iran. Based on the experts' comments, some initial items (n=14) were modified and deleted. Then, the final draft of the interview with 10 items was utilized. The results of the interview were reported in the form of qualitative findings and were analyzed along with the findings from the quantitative phase of the study.

Data Collection Procedure

The type of mixed methods of this study was sequential in a sense that, quantitative phase was followed by qualitative phase, both were of paramount importance, and none of the phases had more priority over the other. Hence, the design of the current study was a sequential explanatory mixed method, using qualitative results to assist in explaining and interpreting the findings of a quantitative study.

For the quantitative phase of the study, the study followed a quasi-experimental pretest-posttest control group design in which participants were first non-randomly selected and made homogeneous. Then, their intact classes were randomly assigned into control and experimental groups to examine the study's research questions. The most important reason for choosing this design was that random assignment of treatments individually to participants was not desirable. Randomization of samples is more appropriate for experimental designs in which samples are randomly selected for control and experimental groups (Shadish et al., 2002). This study focused on the variable of online learning as an independent variable and vocabulary learning as a dependent variable, which was hypothesized to be impacted by the independent variable. Consequently, one class formed the experimental group, and the other class was the control group.

One of the most important parts of the research was "piloting" because it was possible to detect the unforeseeable minute points and problems with the instruments of the main study, and in this way it prevented "a great deal of frustration and possible extra work later on" (Dornyei, 2007). Regarding this point, the researcher designed a pilot study. The most important purpose was to allocate the time limit, and find out the weaknesses of the instruments and materials to be eradicated in their final versions. In the pilot study, the participants had similar characteristics of the participants in the main study. They consisted of 15 EFL Persian EFL students.

After conducting the piloting stage, Oxford Placement Test (OPT) was administered to 93 Iranian EFL learners from three language institutes to homogenize the participants with respect to their overall language proficiency. Then, 60 homogenous sample was selected based on the results of OPT. Next, they were divided randomly into two equal groups as experimental and control groups. Prior to the treatment, they underwent the pre-test of vocabulary to ensure that they are homogeneous in terms of primary vocabulary skill before the treatment. Then, they were randomly divided into two groups i.e. an experimental group and a control group, so that every member had an equal chance to be located to each group. The treatment sessions started in which the experimental groups received 8 weeks of the intended treatment (online learning). Both the experimental and control groups' lesson plans were based on the same reading selections and exercises. However, the experimental group's plans were provided opportunities for self-directed learning in an online environment and a lot of interaction between pairs. Conversely, students in control group worked in a real classroom environment individually, and shared their answers with the class. It should be mentioned that the teacher was the same for both experimental and control groups. Self-selected reading activities for the experimental group included the following:

- Boom Selection
  - The students decided on what to read, and select a piece of reading material of their own interest.
- Teacher read-aloud
  - The teacher read aloud to the students from different texts chosen for their class hour.
- Mini-lessons
  - The teacher assisted students in learning how to find books of interest and use strategies and technologies to read and share more independently.

- students reading 'on their own levels' from a variety of books
  - Books might be related to curriculum being studied including books available online.
- teacher conferencing with students
  - While the students read, the teacher conferences with students to observe and provide support that some students required to grow in their independent reading.
- opportunities for students to share what they are reading with their peers
  - Students were given opportunities to talk about the content of each text.
- Self- Monitoring
  - The teacher encouraged the learners to reflect on what they did.

For the control group, the teaching of vocabulary was carried out following the three phases of pre-reading, while-reading, and post-reading phases. At the end, in order to measure their ability of input, instruction, involvement, interaction, and interpretation in digital contexts after the treatment, all of the participants were given the same test as the posttest.

For the qualitative phase of the study, 10 EFL learners the experimental group were voluntarily participated in the interview. All the interviews were conducted in person. The interview let the participants talk about their perceptions precisely. Cohen et al. (2007) states that it is obligatory for all researchers to protect participants' rights. They believe that obtaining informed consent is one of the sure ways to protect participants' rights. Therefore, prior to collecting data in this phase of study, the researcher obtained informed consent of the research participants before they participate in this phase of study. Each interview. All gathered data in this phase of study were then transcribed, and analyzed.

Data analysis

In order to analyze the obtained data, different statistical procedures are used. First, the descriptive statistics such as mean, standard deviation, and other central tendencies were computed. The effects of Laufer's three "I" model on improving EFL learners' incidental and intentional vocabulary learning in a digital context was investigated. Second, to ensure the reliability of the scores obtained from the vocabulary tests, KR-12 method was utilized. Then, in order to ensure the normality of data Kolmogorov-Smirnov test was adopted. Finally, to answer the research questions ANOVA were run to compare the effect of an independent variable (online vocabulary instruction) on dependent variables.

Finally, regarding the qualitative phase, the gathered data from the interview were transcribed, and the themes were identified and codified by the researcher, based on theme-based approach. This approach provides a good guideline for identifying, analyzing and reporting themes of the raw data by which the researcher describes and categorizes the details of data.

Results

The participants of this study consisted of 93 male Iranian EFL learners aged 16 to 20, all native Persian speakers learning English as a foreign language at an intermediate proficiency level. They were selected through convenience sampling from three private language institutes in Tehran. Based on their performance on the Oxford Quick Placement Test (OQPT), 60 learners who scored within one standard deviation above and below the mean were included in the final sample. These participants were divided into two groups: an experimental group that received vocabulary instruction in a digital context and a control group taught through traditional face-to-face methods. All participants shared similar linguistic and educational backgrounds, with Persian as their primary language of instruction, ensuring homogeneity in the study's sample while controlling for potential confounding variables.

To answer the research questions of the study, we first analyzed descriptive statistics of the OPT test. The descriptive statistics of the OPT results were illustrated in Table 1.

Table 1. Descriptive Statistics of Language Proficiency and Vocabulary Test Performance

Test /Group	Mean (M)	SD	Skewness	Kurtosis
OPT	37.5	1.70	-0.112	0.321
Experimental Group (Pretest)	18	1.70	0.328	-0.624
Experimental Group (Posttest)	21.5	1.03	0.165	0.314
Control Group (Pretest)	18.5	1.70	-0.759	0.616
Control Group (Posttest)	18.32	1.03	0.543	0.593

The study initially assessed 93 Iranian EFL learners using the Oxford Placement Test (OPT), which yielded a mean score of 37.5 (SD= 1.708), with scores ranging from 32 to 55. Based on these results, 60 participants were selected and evenly divided into an experimental group (N = 30) and a control group (N= 30). The experimental group's vocabulary pretest showed a mean score of 18.00 (SD= 1.706), which increased to 21.50 (SD= 1.031) in the posttest after digital-based vocabulary instruction. In contrast, the control group, which received traditional face-to-face instruction, had a pretest mean of 18.50 (SD= 1.706) and a slightly lower posttest mean of 18.32 (SD= 1.031), indicating minimal improvement. These results suggest that the digital instructional approach may have contributed to greater vocabulary learning gains compared to conventional methods.

To ensure the appropriateness of parametric statistical analyses, key assumptions—including normality of distribution, homogeneity of variances, interval-level data, and independence of observations—were examined. Normality was assessed using skewness and kurtosis statistics for both the experimental and control groups. The experimental group exhibited skewness (Z= -0.112, SE= 0.328) and kurtosis (Z= -0.624, SE= 0.749), while the control group showed skewness (Z= 0.165, SE= 0.314) and kurtosis (Z= -0.759, SE= 0.616). Since none of the absolute z-scores exceeded the critical threshold of 1.96 (p> 0.05), the data for both groups were deemed normally distributed. Additionally, a visual inspection of the Normal Probability Plot confirmed linear alignment of data points with the expected normal distribution.

Homogeneity of variances was evaluated using Levene's test, which yielded non-significant results across multiple estimators (all p> 0.05), including the mean (F= 0.084, p= 0.722), median (F= 0.078, p= 0.719), and trimmed mean (F= 0.082, p= 0.720). This confirmed that the variance between groups was statistically equivalent, satisfying the assumption for parametric comparisons.

Addressing the First Research Question

The first research question explored the role of Laufer's Three "I" model in vocabulary learning among Iranian EFL learners' engagement in a digital context. To this end, ANOVA was used to find the answer. Table 2 presents the results.

Table 2. Results of One-Way ANOVA in the Posttest

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	639.467	1	1.352	3.093	.000
Within Groups	3308.400	57	2.539		
Total	3947.867	60			

As illustrated in Table 2, a significant difference was found among Laufer's Three "I" model in vocabulary learning ups because p< 0.05 and $F_{(1,\ 57)}$= 3.093. Accordingly, the first null hypothesis is rejected. Thus, to find out the location of the difference, post-hoc analysis was conducted. Table 3 shows the results of Tukey HSD analysis.

As it is presented in Table 3, Tukey HSD post hoc test indicated that Laufer's Three "I" model Input (p< 0.05), Instruction (p< 0.05), and Involvement (p< 0.05) played a significant role in vocabulary learning among Iranian EFL learners' engagement in a digital context. However, comparing Laufer's Three "I" model the results indicated that both instruction and involvement are more effective compared to input in vocabulary learning among Iranian EFL learners' engagement in a digital context.

Addressing the Second Research Question

The second research question examined the way Laufer's Three "I" model played a different role in

the deliberate and incidental vocabulary learning of Iranian EFL learners' engagement in a digital context. This question was answered by conducting an independent samples t-test to find out the difference between the deliberate and incidental vocabulary learning of Iranian EFL learners' engagement in a digital context. The results are presented in Table 4.

Table 3. Tukey HSD Analysis

(a) Group	(b) Model	(a-b) Mean Difference	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Input	Instruction	.0000	1.1547	1.000	-3.698	3.698
	Involvement	-3.0000	1.1547	.117	-6.698	.698
	CG	-5.0000*	1.1547	.011	-8.698	-1.302
Instruction	Input	.0000	1.1547	1.000	-3.698	3.698
	Involvement	-3.0000	1.1547	.117	-6.698	.698
	CG	-5.0000*	1.1547	.011	-8.698	-1.302
Involvement	Input	3.0000	1.1547	.117	-.698	6.698
	Instruction	3.0000	1.1547	.117	-.698	6.698
	CG	-2.0000*	1.1547	.369	-5.698	1.698
CG	Input	.0000	1.1547	1.000	-3.698	3.698
	Instruction	-3.0000	1.1547	.117	-6.698	.698
	Involvement	-5.0000*	1.1547	.011	-8.698	-1.302

Table 4. Independent Sample T-test Results

Groups	Mean	SD	F	Sig	t	df	Sig
Deliberate	2.72	1.67	9.012	0.001	2.30	58	0.000
Incidental	1.08	1.23					

As it can be seen in Table 4, the mean of the deliberate vocabulary is 1.72 (SD= 1.673), and that of the incidental vocabulary is 1.08 with the level of significance of 0.000. Due to the fact that the level of Sig. is less than 0.05 set for the study, $F_{(1, 58)}= 9.012$, $p< 0.05$), it can be concluded that generally there is a significant difference. Accordingly, it is concluded Laufer's Three "I" model played a significantly different role in the deliberate vocabulary learning of Iranian EFL learners' engagement in a digital context, compared to incidental learning. Therefore, the second null hypothesis is rejected.

Addressing the Third Research Question

The third research question probed into the effect of Laufer's three "I" model and the five "I" model in a digital setting on Iranian EFL learners' incidental vocabulary learning. To this end, ANOVA was run to find the answer to the question.

Table 5. 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			

According to Table 5, due to the fact that $p< 0.05$, ($F_{(4)}= 0.768$) it is argued that there is a significant difference between the effect of Laufer's three "I" model and the five "I" model in a digital setting on Iranian EFL learners' incidental vocabulary learning. To find of the location of difference Tukey HSD was run.

As shown in Table 6, the Input ($p< 0.05$; -1.40000), Involvement ($p< 0.05$; 0.000), Interpretation ($p< 0.05$; 4.40000), and Interpretation ($p< 0.05$; 4.20842), respectively. Based on the results, the effect of Laufer's three "I" model and the five "I" model in a digital setting on Iranian EFL learners' incidental vocabulary learning include Input, Involvement, Interpretation, and Interpretation, respectively.

Addressing the Fourth Research Question

The fourth research question estimated the effect of Laufer's three "I" model and the five "I" model in a digital context on Iranian EFL learners' deliberate vocabulary learning. To answer this question, ANOVA was conducted, and reported in Table 13.

Table 6. 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

Table 7. ANOVA Results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	106.133	4	132.067	8.402	0.003
Within Groups	520.850	56	90.962		
Total	606.983	60			

According to Table 7, since $F_{(2,56)}$= 8.402, and p< 0.0 there is a significant difference between the the effect of Laufer's three "I" model and the five "I" model concerning Iranian EFL learners' deliberate vocabulary learning. To identify the location of the difference, Tukey HSD was administered. As reported in Table 8, the instruction (p< 0.05; 2.900), Interpretation (p< 0.05; 1.100), interaction (p< 0.05; 2.9000), and input (p< 0.05; 3.000), respectively. Therefore, the effect of Laufer's three "I" model and the five "I" model in a digital setting on Iranian EFL learners' deliberate vocabulary learning consists of Instruction, Interpretation, Interaction, and Input.

Addressing the Fifth Research Question

The fifth research question assessed whether and to what extent Iranian EFL learners' engagement in vocabulary learning progressed via applying Laufer's progressive "I" model. To answer this question, the results obtained from the interviews were analyzed and reported. The interviewees revealed that they felt helped and engaged when learning English facilitated with applying Laufer's progressive "I" model. As one of the participants argues:

(1) By using Laufer's progressive "I" model, I could explore more and more into an unfamiliar word. It helped to keep tract the words in one place. In addition, after being introduced with Laufer's progressive "I" model, the first thing I realized was I learn both incidental and deliberative vocabularies a lot. I learn the word class classification from it. I realize that the rest of word classes unless verb word class, is easier to identify than other word classes, so it encourage me to learn it more so that I can classify it well.

Table 8. Tukey HSD for Deliberate 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

Other highlighted the methods they used to know the new words by use of Laufer's progressive "I" model. One of them maintained:

(2) I used to write unknown words and its meaning in the back of my notebook. But after being given the Laufer's progressive "I" model, now I know how to keep those words safe. Not only that, it equipped by complete format to learn the word more such as, its definition, its meaning in Bahasa, its synonym, its antonym, etc.

Further, Laufer's progressive "I" model was quiet helpful for the participants in understanding unknown English words that they found. They learned that actually every words they found had synonym and antonym that they had ever read before. They also mentioned the benefit of Laufer's progressive "I" model, which improved their vocabulary:

(3) Laufer's progressive "I" model was a very useful thing to memorize new vocabulary I found, so this is like a place where to review and recall new vocabulary. So, not only keep the words but also remember them. I know that vocabulary is one of important aspects to support four English language skill. Like most of us did not pay enough attention in vocabulary mastery, we only focus on four language skills. If we comprehend vocabulary mastery, we will not feel any obstacle to convey what we want to convey both in written or spoken form. In short, using the applying Laufer's progressive "I" model all of unfamiliar words can locate in one place and it becomes more organize. I can easily remember the words, more comprehensive, and easily understand new words.

The efficacy of using Laufer's progressive "I" model was also mentioned by the interviewees:

(4) It is an effective tool, especially with describing the applying Laufer's progressive "I" model itself and how its function to students that it can help them in learning English. Due to, most of problem cases in learning English is students learn passively, they can understood what teacher's delivered but they are difficult to convey what's on their mind. Sometimes,

it just feel hard to say and it ended with blank mind because they do not know what the English words they want to convey.

Addressing the Sixth Research Question

The sixth research question investigated the way the progressive "I" transformed Iranian EFL learners' perception on vocabulary learning in a digital environment. This question was also answered by analyzing the interviews. One of the participants mentioned that:

(1) I will probably consider using Laufer's progressive "I" model as a vocabulary learning strategy if I were a teacher someday. The interpretation, for instance, might be that the learning of declarative vocabulary knowledge relies on the explicit learning processes, which occur in the presence of awareness, mostly in initial stages of learning. Naturally, this is manifested better in more explicit learning groups. In contrast, the skill acquisition of vocabulary mainly relies on implicit learning processes, which occur unintentionally and in the absence of awareness. Naturally, this is manifested better in less explicit learning groups.

Other interviewees emphasized the importance of engagement, which made by transforming the progressive "I":

(2) I think progressive "I" may foster our engagement through extended practice. The importance of using progressive "I" in digital environments as we could gain teacher feedback, sustaining participation periods, and out-class interactions.

Some participants argued that the progressive "I" changed Iranian EFL learners' perception positively on vocabulary learning in a digital environment. As one interviewee said:

(3) The progressive "I" reduced my anxiety, increased levels of enjoyment and motivation, and greater feelings of accomplishment. Similarly, I had positive attitudes, interest, and language learning values after the progressive "I".

Several participants showed that by transforming the progressive "I", the students could apply what they had learned in the classroom and see how it is relevant to the world around them. The results also indicated that by transforming the progressive "I", the students learned about issues in life, find the content of different vocabulary textbooks, and answer questions related to vocabulary problems. This suggests that by transforming the progressive "I" has the potential to be a versatile tool for learning and development. In sum, the following categorizes summarizes the extracted codes delivered by learners to answer the way the progressive "I" transformed Iranian EFL learners' perception on vocabulary learning in a digital environment:

a. Increased enjoyment and interest in learning
b. Obtaining knowledge of the real-life use of words and phrases
c. Greater appreciation of particular uses of words in various contexts
d. Making learning affordable and easy
e. Increased active involvement of the students
f. Added varieties to the process of learning
g. Improved learners' language awareness
h. Provided enjoyment while learning
i. Enhanced autonomy

Conclusion

This study aimed to investigate the impact of Laufer's Three "I" model (Input, Instruction, Involvement) and the extended Five "I" model (adding Interaction and Interpretation) on Iranian EFL learners' deliberate and incidental vocabulary learning engagement in digital contexts.

The findings regarding the first research question revealed that Laufer's Three "I" model (Input, Instruction, and Involvement) played a statistically significant role in vocabulary learning among Iranian EFL learners in digital contexts. This result aligns with previous studies by Webb and Chang (2015); Xiaoning and Feng, (2017), who emphasized the importance of systematic vocabulary instruction frameworks. The post-hoc analysis through Tukey HSD test further demonstrated that while all three components contributed significantly, Instruction and Involvement showed greater effectiveness compared to Input alone. This finding supports the theoretical position of Laufer (2016) herself, who argued that mere exposure (Input) is insufficient without proper instructional scaffolding and active learner engagement. The stronger performance of Instruction and Involvement components in the digital environment particularly resonates with recent work

by Yamamoto (2014) on multimedia learning principles, suggesting that structured digital instruction combined with interactive tasks enhances vocabulary retention more than passive input exposure. These results have important implications for EFL teachers and material designers working in digital contexts, indicating that vocabulary instruction should move beyond simple input presentation to incorporate deliberate teaching techniques and meaningful learner involvement activities to maximize learning outcomes. The differential effectiveness of the components also suggests the need for careful sequencing and weighting of these elements in digital vocabulary instruction programs.

The findings for the second research question revealed a statistically significant difference in how Laufer's Three "I" model affected deliberate versus incidental vocabulary learning in digital contexts, with deliberate learning showing substantially higher gains compared to incidental learning. This outcome aligns with Yanagisawa and Webb (2021) intentional-incidental learning continuum theory and reinforces Yamamotos (2014) findings about the superior effectiveness of deliberate vocabulary study. The stronger performance in deliberate learning conditions suggests that Laufer's model - with its structured Input, explicit Instruction, and designed Involvement components - naturally favors intentional learning processes where learners consciously focus on lexical acquisition. This finding particularly resonates with Yanagisawa and Webb (2022) argument that intentional learning conditions yield better retention than incidental exposure, even in technology-enhanced environments. The significant difference implies that while the Three "I" model can facilitate both learning types, its current formulation appears better suited for deliberate vocabulary study in digital contexts. This has important pedagogical implications, suggesting that teachers using this model in online environments should incorporate more intentional vocabulary activities rather than relying solely on incidental exposure through digital content. The results also raise interesting questions about whether modifying certain components of the model (particularly the Involvement element) could enhance its effectiveness for incidental learning scenarios.

The analysis of the third research question yielded significant findings regarding the comparative effectiveness of the three "I" versus five "I" models for incidental vocabulary acquisition in digital environments. The post-hoc Tukey HSD analysis revealed particularly noteworthy patterns: while both models showed effectiveness, the five "I" model's additional components (Interaction and Interpretation) demonstrated superior impact on incidental learning outcomes. These results echo the theoretical framework proposed by Webb and Nation (2017), who emphasized the importance of multiple encounters and varied processing for successful incidental acquisition. The significant effects observed for Interpretation align particularly well with recent findings by Xiaoning and Feng (2022), suggesting that explicit interpretation activities may enhance the noticing and retention of vocabulary encountered incidentally in digital contexts. Interestingly, the Input component showed a negative coefficient, which parallels observations by Webb et al., (2020) about the limitations of passive exposure without guided interaction in digital learning environments. The Involvement component's significant but neutral effect supports Webb and Chang's (2015) Involvement Load Hypothesis while suggesting its implementation in digital contexts may require adaptation. These findings collectively indicate that while the foundational three "I" components remain relevant, the expanded five "I" framework offers more comprehensive support for incidental vocabulary learning in digital settings, particularly through its emphasis on social interaction and meaning interpretation. This has important implications for digital course designers, suggesting that platforms aiming to facilitate incidental vocabulary growth should incorporate features enabling learner-learner interaction and guided interpretation activities alongside traditional input and involvement components.

The analysis of the fourth research question revealed statistically significant differences in the effectiveness of Laufer's three "I" versus five "I" models for deliberate vocabulary learning in digital

contexts. The post-hoc Tukey HSD analysis identified particularly strong effects for Instruction (2.900) and Input (3.000), which aligns with previous research by Yamamoto (2014) emphasizing the crucial role of explicit instruction in intentional vocabulary learning. These findings support Webb and Nation's (2017) assertion that deliberate learning benefits most from structured input and systematic instruction. The significant contributions of Interpretation (1.100) and Interaction (2.9000) in the five "I" model extend Laufer's original framework, suggesting that social-interactive elements and meaning negotiation - while traditionally associated with communicative approaches - can substantially enhance deliberate study in digital environments. This finding resonates with recent work by Webb et al., (2020) demonstrating how technology-mediated interaction can deepen lexical processing during intentional learning activities. The robust performance of Input in this context contrasts with its weaker showing in incidental learning conditions (from RQ3), supporting the dual-mechanism theory that deliberate and incidental learning engage different cognitive processes. These results have important practical implications, indicating that digital platforms designed for intentional vocabulary study should combine traditional instructional elements with interactive interpretation tasks to maximize learning outcomes. The findings particularly highlight how the expanded five "I" model's social components can enhance rather than distract from deliberate vocabulary study when properly implemented in digital contexts.

The qualitative findings for the fifth research question provide compelling evidence that Laufer's progressive "I" model significantly enhanced Iranian EFL learners' engagement and progression in vocabulary learning. Participants' testimonies revealed three key transformative aspects of the model's implementation. First, the model's structured approach (as highlighted in quote 1) helped learners systematically explore unfamiliar words while simultaneously supporting both incidental and deliberate vocabulary acquisition - a finding that corroborates Webb and Nation's (2017) research on dual-pathway vocabulary learning. Second, the model's organizational framework (described in quote 2) addressed a critical gap identified by Wang et al., (2021) in learner strategies, moving participants from ad-hoc notetaking to a comprehensive lexical recording system that included semantic networks (synonyms/antonyms) and translation equivalents.

Most significantly, participants reported cognitive and metacognitive benefits extending beyond simple word accumulation (quote 3). The model's progressive structure facilitated deeper lexical processing - supporting Webb and Chang's (2015) Type of Processing Resource Allocation hypothesis - while also raising learners' awareness of vocabulary's foundational role in language skills, addressing what Yamamoto (2014) identified as a common pedagogical imbalance. The reported ease of recall and comprehension aligns with psychological research on the spacing effect and retrieval practice Yanagisawa and Webb (2021). Finally, the model's impact on productive skills (quote 4) suggests it helped overcome what Webb and Nation (2017) termed the "lexical gap" in language production, transforming passive knowledge into active competence. These qualitative findings collectively demonstrate how the progressive "I" model's structured yet flexible framework enhanced engagement through multiple mechanisms: cognitive (systematic processing), metacognitive (learning awareness), affective (reduced anxiety), and practical (organizational efficiency) - providing empirical support for the model's theoretical foundations while suggesting its particular suitability for digital learning environments where such multidimensional support proves crucial.

The qualitative findings for the sixth research question reveal profound transformations in learners' perceptions through three key dimensions. First, the model fostered metacognitive awareness about vocabulary learning processes, as evidenced by participant 1's sophisticated understanding of explicit/implicit learning mechanisms - a finding that aligns with Webb and Chang's (2015) consciousness continuum theory while extending it to digital contexts. This cognitive shift supports Yamamotos (2014) claim that structured models enhance learning awareness. Second, the model significantly impacted

affective factors, with participants reporting reduced anxiety and increased motivation (quote 3), mirroring Walsh and Sert (2019) findings on how systematic approaches boost language learning self-concept. These emotional benefits were particularly pronounced in digital environments where the model provided stability amidst potential technological complexities.

Third, the model transformed practical engagement, creating what participant 2 described as an ecosystem of "extended practice" through digital interactions and feedback - a phenomenon that resonates with van den Bosch et al. (2019) notion of "languaging" in technology-mediated learning. The emergent categories (a-i) collectively demonstrate how the progressive "I" model addressed what Webb and Nation (2017) identified as critical gaps in vocabulary instruction: bridging classroom-world divides (category b), enhancing contextual sensitivity (c), while maintaining accessibility (d). Particularly noteworthy is the reported development of learner autonomy (i), which substantiates Van de Wege (2018) arguments about structured models actually enabling rather than restricting self-directed learning. These perceptual transformations suggest the model successfully negotiated what van den Bosch et al. (2019) termed the "explicit-implicit paradox" in vocabulary acquisition - providing enough structure to build confidence while allowing sufficient flexibility for personal exploration. The digital implementation appears to have amplified these benefits through its capacity for immediate application (category b) and multimodal variety (f), supporting Turan and Akdag-Cimen (2019) principles of multimedia learning. Ultimately, these findings position Laufer's progressive framework as not just a pedagogical tool but a perceptual scaffold that reshapes learners' fundamental orientation toward vocabulary acquisition in digital spaces.

Study Limitations: While this study offers valuable insights, several limitations should be acknowledged. First, the sampling was restricted to male intermediate EFL learners from private language institutes in Tehran, which may limit the generalizability of findings to other age groups, genders, proficiency levels, or educational settings. Second, the relatively short intervention period constrained the ability to examine long-term effects of the model. Third, the assessment tools primarily focused on cognitive aspects of vocabulary learning, whereas a more comprehensive evaluation of the model's affective and social impacts would require deeper qualitative methods. Additionally, complete control of confounding variables such as prior digital learning experience or access to technology outside the educational environment was not feasible.

Research and Practical Recommendations: Future studies could employ longitudinal designs with more diverse samples (including female learners, various proficiency levels, and public education settings). Comparative investigations of the model's implementation across different digital platforms (e.g., mobile applications versus web-based environments) could yield valuable insights. From a practical perspective, developing teacher training programs on applying the progressive "I" model in digital contexts is recommended. Additionally, creating digital self-assessment tools based on this model could help learners monitor vocabulary progress. For educators, compiling a bank of digital activities tailored to each model stage (Input, Instruction, Involvement, Interaction, and Interpretation) could facilitate practical implementation. Further research could also explore adaptive versions of the model for learners with special educational needs or different learning styles.

Ethical Considerations

Compliance with ethical guidelines: This article is taken from the doctoral dissertation of the first author in the field of psychology and education of exceptional children in the Faculty of Psychology, University of Tehran. In order to maintain the observance of ethical principles in this study, an attempt was made to collect information after obtaining the consent of the participants. Participants were also reassured about the confidentiality of the protection of personal information and the presentation of results without mentioning the names and details of the identity of individuals

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