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# Enhancing Vocabulary Learning through Technology: Al-Driven Pushed Output Hypothesis for Saudi EFL Learners

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Abstract: The study explores the impact of AI-driven technology in enhancing vocabulary acquisition among Saudi EFL (English as a Foreign Language) learners. It employs the Pushed Output Hypothesis (POH) as a theoretical framework, emphasizing the role of AI in promoting active language production. The study highlights various AI tools and their effectiveness in improving learners' vocabulary retention and usage. The significance of the study lies in its comprehensive analysis of students' work, highlighting the impact of language instruction on vocabulary size and lexical errors. A mixed-methods approach was used to analyze quantitative vocabulary size (measured via V\_Words) and qualitative lexical errors (categorized using Engber's 1995 taxonomy). The study involved three male Saudi undergraduate EFL learners enrolled in an English degree program at Albaha University. Each participant engaged in all three conditions over five weeks, submitting nine writing samples in total. Findings reveal that the pushed email condition significantly outperformed both classroom-based conditions, leading to greater vocabulary expansion and lexical accuracy. The study highlights email as a viable AI-enhanced tool that enables learners to self-correct, reflect on language use, and develop metalinguistic awareness in a low-pressure, asynchronous environment. These findings contribute to the growing discourse on technology-enhanced learning and its role in optimizing vocabulary acquisition. Despite its contributions, the study acknowledges limitations, including sample size constraints, demographic homogeneity, and the short-term nature of the intervention. Future research should explore longitudinal effects, gender-based variations, and alternative AI-driven feedback mechanisms.

Keywords: Vocabulary Learning, EFL Learners, Saudi Arabian Students, Pushed Output, Technology-Enhanced Learning, Vocabulary Acquisition, Lexical Errors.

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#### 1. Introduction

Vocabulary acquisition is an essential component of second language (L2) learning, influencing reading comprehension, writing proficiency, and communicative competence (Nation, 2001; Schmitt, 2008). However, students often struggle to expand their lexicon, as vocabulary instruction in EFL settings tends to be limited and underemphasized (Waring & Nation, 2004; Webb & Chang, 2012). Swain's Pushed Output Hypothesis (POH) (1985) suggests that students recognize lexical gaps and improve language

production when they are pushed to produce output beyond their current proficiency level. This concept underpins the role of technology in modern vocabulary instruction.

1.1. Rationale of the Study

The rationale for this study is twofold:

- Addressing the Gap in AI-Enhanced Pushed Output Research The role of AI-driven feedback tools in EFL vocabulary learning has not been extensively studied in the Saudi context. This study examines the effectiveness of AI-supported email feedback, which allows learners to revise their output, reflect on feedback, and self-correct asynchronously.
- 2. Extending the Pushed Output Hypothesis to Technology-Based Learning While pushed output has traditionally been examined in classroom environments, its application to digital, AI-enhanced learning remains underexplored. This study integrates pushed output and email-based feedback, offering a novel perspective on the intersection of technology and vocabulary acquisition.

By addressing these aspects, this study contributes to the growing discourse on technology-enhanced learning and its role in optimizing vocabulary acquisition in EFL contexts.

#### 2. Literature Review

#### 2.1. Vocabulary Learning and the Pushed Output Hypothesis

Developing vocabulary in a second language (L2) is crucial for communicative ability and language mastery (Schmitt, 2008). For example, Nation (2001) found that vocabulary expansion is a significant predictor of reading comprehension. Despite this well-founded claim, research (Webb & Chang, 2012) has noted that students are slow to expand their lexicon and that instructors seldom spend sufficient time on vocabulary instruction (Waring & Nation, 2004). Swain (1985) proposed that students are more likely to identify lexical discrepancies between their intended utterance and the actual spoken language if they are "pushed" to generate it through specific immersion techniques. Ellis (2003) attributes this recognition of 'gaps' on the learner's part to 'improvisation'—the learner inferring norms and meanings in the new language while speaking incorrectly.

An essential aspect of gap identification during speaking is the development of metalinguistic skills, which allow the learner to evaluate their language and detect faults. As Stetsenko and Arievitch (1997) observed, these skills may emerge during cooperative group activities and become 'internalized' as the learner corrects his/her own mistakes. Language immersion thus generates the 'push' needed for the student to continue using the L2.

For this study, it is crucial to distinguish between pushed output (which encourages reflection on mistakes and self-correction) and non-pushed output, where such reflection is not encouraged.

#### 2.2. Technology-Enhanced Pushed Output and Self-Correction

Technology provides valuable tools for implementing pushed output in language learning. The COVID-19 pandemic led to an increased reliance on online learning (Albaqami & Alzahrani, 2022), underscoring the potential of email-based instruction.

Research indicates that asynchronous feedback (e.g. email responses) affords students with more time for reflection, leading to vocabulary retention as well as greater accuracy (Nazarı & Nıknejad, 2015).

Furthermore, email may improve the quality and quantity of output (Allagui, 2014; Avci & Adiguzel, 2017). Online conferencing and emails may improve vocabulary and production by necessitating responses in a less formal manner rather than traditional classroom instruction. As a result, email enhances language acquisition, productivity and motivation, enabling learners to express the target language with precision.

This paper examines how various vocabulary learning environments affect the vocabulary growth of Saudi adult EFL students, particularly focusing on the effects of email as a technological tool for encouraging pushed output. In contrast to learning through traditional classroom methods, the paper investigates how email-based feedback might promote self-correction and metalinguistic awareness.

According to Swain's concept of pushed output, language students must be encouraged to produce correct, appropriate, and sophisticated language to progress (McDonough, 2005). The contextualising and changing stages of language acquisition suggest that pushed output assists learners improve (Setyaningsih et al., 2021; Swain, 1995). An immersion program, where learners are placed in an environment where they must utilise the target language exclusively, out and in the classroom, is one such educational approach designed to provide maximum exposure to the target language. However, in these programs, learners may have limited opportunities to negotiate meaning within the classroom because the primary focus is on using the language for communication rather than explicit language instruction. When focused on communication, learners have restricted opportunities to practice and refine their language skills through feedback and correction.

Swain therefore emphasized the importance of language production outside the classroom as a learning strategy. When learners encounter knowledge gaps during their language use, they become aware of areas that need improvement through further learning (Alfarwan, 2022). In Swain's output hypothesis (Wright, 2016), pushed output improves gap identification, the testing of hypotheses, and the management and internalization of linguistic knowledge.

Research supports these claims. For example, Shintani (2011) found that input and output exercises improved ESL learners' productive and receptive vocabulary. Birjandi and Jafarpour Mamaghani (2014) demonstrated that both immediate and delayed written pushed output improved the use of English verb tenses compared to a control group. According to Azizi (2016), input negotiation with pushed output is less effective than input negotiation without output. Although there is no consensus on this, a substantial amount of research has found that pushed output improves L2 accuracy and vocabulary.

Despite the substantial support for the benefits of pushed output, some studies have questioned its credibility due to methodological issues or limited sample sizes. For instance, de la Fuente (2002) found that output surpassed input among 32 intermediate English-speaking learners of Spanish. Shintani (2011) observed that both input and output improved vocabulary learning among 36 Japanese EFL students. Hazrat and Hessamy (2013) reported that oral pushed output improved listening comprehension and active vocabulary acquisition more than written output. However, Sadeghi Beniss and Edalati Bazzaz (2014) revealed that while pushed output instruction improved accuracy, it did not enhance fluency. Nonetheless, a significant body of research,

including studies by Swain (1995) and McDonough (2005), supports the notion that pushed output facilitates language learning by encouraging self-correction and linguistic adaptation, thereby validating its credibility in enhancing language proficiency.

The methods utilised in these studies are worth investigating. de la Fuente (2002) conducted a study of 32 English-native intermediate students of Spanish at Georgetown University, participants were allocated into three groups and received 90 hours of formal L2 education. The students were randomly assigned to courses that included negotiated input with output, without output, or non-negotiated input. The findings showed that learners who were required to generate output illustrated superior performance in productive vocabulary assessments compared to those who were only required to generate input.

In their 2014 study, Beniss and Bazzaz quantitatively investigated pushed output and speaking accuracy and fluency. An IELTS speaking exam was administered to about 30 female L2 learners who were randomly allocated to either an experimental group or a control group. The experimental group received pushed output education, while the control group received non-pushed output education. The IELTS speaking exam data and subsequent participant interviews were transcribed, coded, and recorded for accuracy and fluency. The pushed output group outperformed the non-pushed output group in terms of accuracy, although fluency findings were similar across both groups. Thus, pushed output improved accuracy (Sadeghi Beniss & Edalati Bazzaz, 2014).

Namaziandost, Nasri, and Ahmadi conducted a 2019 study to explore how pushed output might affect Iranian L2 learners' reading comprehension. Fifty male pre-intermediate learners were randomly assigned into experimental and control groups. The experimental group was given a pushed output task, while the control group had no intervention. After the treatment, a post-test revealed that the experimental group outperformed the control group, illustrating that pushed output education enhanced reading comprehension.

López Páez (2020) investigated the effects of pushed output on L2 oral production in 16 Colombian 7th-grade students of English at a private school. The learners were randomly allocated to output and non-output groups. Over five weeks, the output group participated in oral pushed output exercises while the non-output group completed comprehension tasks. Data was gathered via interviews, prompted recollections, and audio recordings. The results illustrated that students were able to modify their oral output to a greater extent in one-way pushed output activities than in two-way exercises. Furthermore, they achieved parity in semantic competence and standardised syntax through these activities.

According to Alahmadi, Albaqami and Foltz (2023), vocabulary instruction was investigated using WhatsApp both in and out of class. The messaging app showed a modest but statistically significant influence on learning vocabulary outside the class, but not in the class. Moreover, the paper illustrated that Saudi learners enjoyed using WhatsApp to learn, especially with terms of instructor availability. Finally, it was determined that lea who were more motivated to utilise WhatsApp in the classroom exhibited greater learning gains than those who were less enthusiastic about it.

The findings of these studies indicate that pushed output can improve vocabulary retention by promoting productivity. However, other factors, such as the technology used and the learning environment, play a role in the outcomes. As Jafari and Chalak (2016) stated, increasing technology usage in an interactive setting may help strengthen cognitive processes for vocabulary acquisition and self-correction. Their study showed

that students used a greater number of words to articulate their thoughts, views, and descriptions as they were encouraged to produce and modify their work, whether in person or digitally. This, in turn, resulted in more precise and succinct language production. Employing technology allows students to interact and evaluate their language. While face-to-face learning offers many of the same possibilities as digital learning, the less-pressured environment provided by technology is expected to yield better results.

Albaqami (2024) conducted research on the role of technology and pushed output in vocabulary acquisition among Saudi EFL students. The results indicate that emailbased pushed output improves vocabulary retention and is well-received by students. Nevertheless, the present research endeavours to address the discrepancy between these studies by examining the efficacy of email-based feedback in fostering vocabulary development and self-correction in comparison to conventional classroom methods. This study will investigate the efficacy of email in fostering a learner-centred approach to vocabulary development by using a counterbalanced design to investigate the influence of various learning environments on vocabulary size and lexical errors. It is advised that additional research be conducted to investigate the incorporation of technology into language instruction in order to optimise learning outcomes.

Using a mixed-methods study of Saudi university-level intermediate EFL students, this research will contribute to the findings on pushed output and its potential to enhance vocabulary acquisition and retention. Several studies have examined digital habits, notably messaging apps (including email), as a teaching and learning resource for L2 instruction. These studies have generally focused on general language progress in areas such as motivation and spelling/writing, rather than pushed output or in class or out of class differences.

Pushed output is an appropriate choice for study since EFL classrooms are increasingly utilising instructional techniques that emphasise activities, output, and interaction. This is consistent with Long's (1980) interaction theory, which states that face-to-face contact supports L2 acquisition (Van Patten & Williams, 2014). While the current research focuses on technology rather than face-to-face interaction, it recognises that the importance of interactive components is beneficial for processing novel language items and activities, as well as psycholinguistic-related reactions.

This study investigates the potential implications for teaching practice of supplementing classical educational techniques with pushed output utilising digital platforms outside the classroom. By utilising email for pushed output, the research seeks to improve learning and vocabulary usage through comprehension, testing and production.

#### 2.3. The Role of AI-Driven Feedback in Vocabulary Acquisition

The introduction of AI-powered tools, such as ChatGPT, has resulted in automated feedback systems providing real-time adjustments and suggestions (Kohnke, Moorhouse, & Zou, 2023). AI improves self-correction practices, as students can track errors, revise their work, and refine their vocabulary choices independently (Jiao et al., 2023).

Long (1996) explained feedback as data that assists students in identifying and correcting mistakes. Swain contended that feedback can encourage linguistic adaptation, making language production the major focus of learning (Swain, 2000). Engaging students in creating stories based on given contexts and target words can enhance the meaningfulness of an activity, thereby improving engagement and vocabulary retention, as suggested by Wong and Looi (2010).

The word production processes of ESL learners while developing lexical competence involve mechanisms that generate or derive new words in a language (James, 2013). Such word creation mechanisms include alterations to word structure, meaning, and grammatical class, which aid learners in expanding their vocabulary (Ellis, 1997). L2 vocabulary acquisition is influenced by word formation processes, which reflect learners' comprehension of word structure and connections (Laufer & Waldman, 2011). Inferring the meaning and use of new terms from their morphological components and patterns may also help learners acquire vocabulary (Schmitt & Zimmerman, 2002). To assess students' lexical competency and progress, this research specifically examines their use of suffixes and derivations in writing.

#### 2.4. Research Gap

The current study addresses a gap in the literature on how email can be used to enhance learning and teaching both inside and outside the classroom (East & King, 2012; Goertler, Bollen, & Gaff, 2012), particularly in the context of vocabulary learning (Grgurović, 2011). The study's participants are adult EFL learners using email to facilitate pushed output. While previous research has investigated the use of messaging applications and transmitted output, such as De la Fuente's (2003) study on vocabulary acquisition among undergraduate students, the present study takes a different approach. De la Fuente's research focused on Spanish learners studying noun meanings, whereas this study focuses on Saudi Arabian male adult learners of EFL, using verbs and abstract nouns to write stories over both long and short terms.

In Saudi Arabia, the integration of technological advances into EFL education is not well understood. The COVID-19 pandemic necessitated a shift to online instruction through platforms like email and Zoom, underscoring the need for research on how these technological tools can enhance EFL learning. This study aims to fill the gap in understanding the effectiveness of using email to support vocabulary acquisition and pushed output in Saudi Arabian EFL education.

Meanwhile, in the UK, the pre-Brexit influx of L2 learners from Eastern Europe, Iraq, and Afghanistan led to a significant increase in the need for EAL (English as an Additional Language) education. The COVID-19 pandemic further highlighted the global importance of utilising new technology, such as email and Zoom, in language education, making this area of study relevant for enhancing EAL instruction in the UK. However, studies on EAL and technology utilization in the UK are scarce. In fact, Arnot et al.'s (2014) Refugee Council article is the sole publication on EAL education and technology in the UK. This article examined classroom EAL education and the use of technology, focusing on group cooperation rather than individual collaboration. The current research may therefore address a gap in our understanding of how technological advances can support EAL education in this context.

Returning to Saudi Arabia, Al-Ahdal and Alharbi (2021) conducted the only known study on this topic, which emphasized group cooperation and concentrated solely on short-term outcomes. In contrast, the present research examines both short-term and long-term effects, providing a more comprehensive analysis of university ESL students' vocabulary acquisition via pushed output.

This research aims to fill these gaps in the literature by conducting a qualitative investigation using Engber's (1995) lexical mistake taxonomy, focusing on lexical selection and form. The study involved 27 pieces of writing, with each student providing

nine writing samples from weeks 1, 3, and 5 (three for each of the three conditions: pushed class, pushed email, and non-pushed). This approach ensures that the study will contribute to the instructional literature by providing detailed insights into vocabulary acquisition and assessment over varying timeframes.

# 3. Methodology

## 3.1. Research Questions

This study seeks answers to the following questions:

- 1. Is there a significant difference in vocabulary size among students who participated in a pushed email condition, a pushed class condition, and a non-pushed class condition?
- 2. Do students' lexical choices and forms significantly improve over time, regardless of whether they are subjected to a pushed class condition, a pushed email condition, or a non-pushed class condition?

## 3.2. Research Design

The objective of this research is to contrast three conditions—pushed email, pushed class, and non-pushed class—to elucidate their effects on three students. The study investigates how these conditions might influence the participants' usage of target vocabulary. Each participant experienced all three conditions in a different sequence using a within-subject design to compare the effects: teaching via conventional techniques with no pushed output, studying in a classroom with pushed output, and learning via email with pushed output.

## 3.3. A Quasi-experimental Study

The present study employs a quasi-experimental design with pre-formed class treatment groups, which is typical for educational intervention studies. As Bryman (2012) noted, quasi-experimental research helps determine whether the treatment has had the anticipated effect on the study's participants. The practicality of quasi-experimental studies makes them beneficial, and this research is designed to be more ecologically valid, resulting in more accurate generalizations.

This research uses a balanced design to examine the learning outcomes of three conditions: conventional techniques without pushed output, a class with pushed output, and email with pushed output. A counterbalanced design compensates for ordering effects, such as performance fluctuations over time (Mitchell & Jolley, 2012). In this design, conditions were randomly assigned to participants so that they encountered them in different sequences (Meschyan & Hernandez, 2002).

Ordering effects can significantly impact experimental findings. Participants may exhibit a primacy effect (improved memory of the initial items) or a fatigue effect (decreased performance due to monotony or effort) if they are initially exposed to the same condition. They may also show a practice effect (enhanced performance due to familiarity or learning) or a recency effect (greater recall of recent items) if they are subsequently exposed to the same condition (Meschyan & Hernandez, 2002). These ordering effects can obscure the impact of the conditions and distort the study's findings. By using a counterbalanced design, this study ensures that each participant experiences the three conditions in a unique order, minimizing the potential for such biases.

Table 1 presents the three groups and the vocabulary targets for learners taught under each of the three conditions. Lyster (2007) suggested that using a balanced design for instructional intervention studies allows L2 learners to better understand and engage with the language during activities.

	Vocab Set 1	Vocab Set 2	Vocab Set 3
Group 1	Pushed output class	Non- pushed out class	Pushed output email
Group 2	Pushed output email	Pushed output Class	Non-pushed output class
Group 3	Non-pushed output class	Pushed output email	Pushed output class

	Table	1:	Phases	of	the	instructional	intervention
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#### 3.4. Participants

In the second semester of the 2023–2024 academic year (November – February), three adult male Saudi language learners, aged 20–24, were selected from their third-year English specialization classes at Albaha University, Saudi Arabia. These Arabic-speaking undergraduates are majoring in English. For the study, I selected one student from each group: Student A from group 1, Student B from group 2, and Student C from group 3. Data collection focused on weeks 1, 3, and 5, concentrating on students' writing samples. Each student provided nine samples, with three collected in each of weeks 1, 3, and 5, resulting in a total of 27 writing samples.

#### 3.5. Inclusion and Exclusion Criteria

This study established specific inclusion and exclusion criteria to ensure the selection of a homogeneous group of participants and to enhance the validity and reliability of the results. The inclusion criteria required that all participants be male Saudi undergraduate EFL learners enrolled in the third-year English specialisation program at Albaha University, aged 20 to 24 years old, and have an intermediate level of English proficiency, as determined by a university-administered placement test. Additionally, only students who provided informed consent and demonstrated a willingness to participate throughout the study were included. Conversely, students with beginner or advanced proficiency levels, as well as those who had prior experience with Al-assisted vocabulary learning tools, were excluded to maintain consistency in the baseline knowledge of participants.

#### 3.6. Ethical Considerations

Ethical considerations were observed throughout this study to ensure participant rights, confidentiality, and research integrity. Prior to data collection, informed consent was obtained from all participants, ensuring they understood the study's purpose, procedures and potential risks. Participation was entirely voluntary, and students were given the option to withdraw at any stage without consequences. To maintain confidentiality and anonymity, participants' personal information was not disclosed, and all responses were coded for analysis. Additionally, ethical approval was obtained from the university's Institutional Review Board (IRB) before conducting the study. All data were securely stored and used solely for research purposes, with access restricted to the principal investigator. By upholding these ethical principles, the study ensured that participants were treated with respect and integrity, safeguarding their well-being throughout the research process.

#### 3.7. Materials

The three students were taught 90 target words over five weeks—18 words per week and six words per class (i.e., three classes weekly). According to the class timetable, 10 out of 30 units from the coursebook were selected for the five-week program.

The assessments focused on abstract nouns and verbs that matched the students' language skills. Verbs are fundamental for sentence construction, as Tomasello (1992) notes that every sentence requires a verb, and the choice of verb typically determines the structure of the sentence. Verbs help students learn how to form sentences. In a study by Bird, Howard and Franklin (2001), it was shown that abstract nouns, which are crucial for constructing sentences, are acquired in conjunction with verbs, as abstract nouns represent mental concepts while verbs pertain to physical actions. Therefore, these two types of words were selected for the study.

These features align with the findings of Skinner and Wellborn (2019) and López Páez (2020), who emphasized the importance of oral teaching and diverse instructional methods for promoting 'pushed output.' Some languages share root sounds or words for similar terms in their verb conjugation and noun usage. Hearing a verb in their native language and a phrase in another language may help students determine how to modify a verb or noun for coherence. As research continues, it has become increasingly clear that 'pushed output' settings are highly effective for language acquisition, though there is still much to learn about their optimal use. By promoting output, autonomous learning, and critical thinking, students can better address their language learning strengths and weaknesses (Wei, 2017). Encouraging students to read and write letters, create stories, or engage in conversation can enhance their learning. When given feedback, they learn to incorporate it into future responses.

#### 3.8. Data Elicitation Tool Administration

Lexical items from 4000 Important English Words (Nation, 2009) were used in the study. Participants learned the target vocabulary in three different conditions over five weeks, with 18 words introduced each week, six per condition. The 90 target words were divided into three sets of 30 words. These words were counterbalanced to prevent ordering effects. In class 1 of week 1, the first six words from each set were taught, and so on.

There were three groups of students, each experiencing all three conditions but in a different order. Each group was responsible for learning all 90 words, divided into sets of 30, with each set taught under a different condition. This process is known as counterbalancing.

For this paper, I analyzed 27 writing samples collected during weeks 1, 3, and 5. Three students were selected: Student A from group 1, Student B from group 2, and Student C from group 3. Each student completed nine writing samples: three for each condition in week 1, three in week 3, and three in week 5, resulting in a total of 27 writing samples for analysis.

Participants were informed of the experiment's objective and procedures in the first week. The selected coursebook has six levels that teach high-frequency English vocabulary. Unlike traditional vocabulary books, which organize units by subject (e.g., sports, cookery, vehicles), the book used for this study employs graded reader stories to teach vocabulary. As Perks and Lauritsen (2016) noted, language acquisition often

involves storytelling. Graded readers help second-language learners acquire vocabulary by simplifying the language (Nation & Meara, 2010). The participants had not been taught the target terms before the experiment and writing assignment.

The three conditions were as follows:

- 1. The Pushed Email Condition: This condition focused on email-based language training and production. Students received the task every Tuesday and had until the following Monday at 12 p.m. to submit it, although they were expected to complete it within 90 minutes. The teacher provided feedback within seven days, though it could be given on the same day if the email was submitted before the deadline. The instructor did not intervene, and students were not required to learn the meanings of the target words but were required to use them in a story format. They were simply asked to incorporate the six words into a narrative and submit their story to the instructor for feedback.
- 2. The Pushed Class Condition: This condition focused on classroom-based language training and production. Like the email condition, this exercise required learners to use the target language. Due to the counterbalanced sequence of conditions across the three groups, every participant experienced this condition at some point in the experiment. Students received the task every Tuesday and were required to complete it within 90 minutes. They had to compose a narrative using six target words and received immediate feedback from the instructor. After completing their stories, students submitted them to the instructor in class and received a written evaluation.
- 3. The Non-Pushed Class Condition: This condition also took place in the classroom but without any emphasis on pushed output. Students kept copies of their writings, and during the 90-minute class, the instructor provided no specific instructions. Students were allowed to complete their stories early if they wished. Language instruction was conducted in a conventional classroom environment, and no feedback was given on their work.

#### 3.8. Qualitative Data Analysis

#### 3.8.1. Analysis of Students' Writing

The research used Meara and Miralpeix's (2016) V\_Words website to assess the students' vocabulary knowledge. V\_Words is an online platform that analyzes short, simple texts of up to eighty-five thousand words using a frequency-based vocabulary size evaluation. Since the learners were required to use six target words in their stories, with each story being under 300 words, the word limit of V\_Words was sufficient for each student's scenario. V\_Words analyses any textual unit with spaces on either side of a word, including contractions unless their complete forms are used (for example, "she is" versus "she's" or "we would" versus "we'd").

The V\_Words website was chosen for a number of reasons. It is accurate and dependable, eliminating measurement biases and inconsistencies (Meara & Miralpeix, 2016). To verify the instrument accurately measured the intended constructs and avoided bias, rigorous testing and validation procedures were required. Second, the students in this paper were able to post their writings online and receive instant evaluations of their vocabulary use, making it easy to administer and score. Furthermore, V\_Words utilises a relevant definition of vocabulary size that reflects a learner's knowledge

of terms rather than just the text's overall word count (D'Anna, Zechmeister, & Hall, 1991). Last, Milton and Treffers-Daller (2013) pointed out that prior research has used the V\_Words website or similar assessments to investigate the correlation between vocabulary knowledge and academic writing competency. For these reasons, the V\_Words website was selected to analyse the participants' work, ensuring that the research would generate trustworthy and valid data about the participants' language competency (Meara & Miralpeix, 2016).

## 3.8.2. Analysing Lexical Errors

Lexical errors are mistakes language students make while choosing or constructing words. Numerous lexical elements and word combinations may be subject to errors. Engber (1995) categorised lexical mistakes into two main categories: selection and form.

Engber's (1995) inventory of lexical mistakes was used to analyze the students' writing, offering a comprehensive and systematic framework for recognizing and categorizing lexical errors by type and frequency. Below is an outline of how Engber's inventory was used to achieve the research objectives:

#### Lexical Choice

- Single lexical items: These are word selection errors where learners could utilise inappropriate terms to convey meaning. For instance substituting "large" for "big" or "satisfied" for "joyful" (Badilla & Núñez, 2020).
- 2. Combinations: These errors appear when students mis-combine words in sentences, leading to incorrect collocations or word order. For instance substituting "go to cinema" for "go to the cinema" or "make a party" for "have a party".

#### Lexical Form

- 1. **Derivational mistakes:** These involve errors in adding prefixes or suffixes to words, potentially creating non-existent words or altering meanings. For instance using "confliction" instead of "conflicts."
- 2. Verb forms: Errors in verb tense, aspect, or agreement fall into this category. For example, "I goed to school" instead of "I went to school" or "She don't like apples" instead of "She doesn't like apples" (Kusumawardhani, 2018).
- **3. Major spelling problems:** Spelling errors that modify words and may impair text readability and understanding. For instance spelling "beautiful" as "bautiful" or "restaurant" as "resturant."

Engber's taxonomy provides a thorough categorisation of lexical errors, enabling a detailed investigation of the most common issues among language learners and emphasising areas for development. Moreover, it is widely utilised in classroom instruction, error analysis and language assessment (Engber, 1995). The taxonomy assists teachers identify learner weaknesses and adapt their teaching accordingly, informing vocabulary teaching methods and aiding in the creation of materials and exercises for various proficiency levels.

Several research has utilised Engber's taxonomy to analyse ESL learners' oral and written performance and lexical errors. For instance, Lu (2012) utilised a computational approach to measure lexical density, complexity, and variety and compared these metrics to raters' judgments of ESL students' oral narratives. The research found that Engber's taxonomy helped identify vocabulary issues and provide teaching suggestions based

on both the researcher's results and Zarei's (2013) results. Zarei (2013) investigated the lexical errors and writing quality scores of Iranian EFL students and found Engber's taxonomy effective for analysing lexical mistakes and literary quality.

#### 3.8.3. ChatGPT for Word Choice, Lexical Mistakes, and Ratings

The qualitative examination of the learners' compositions was carried out utilising Engber's (1995) lexical error categorisation. After identifying lexical errors, two native-speaker PhD students evaluated them. ChatGPT was then utilise to generate alternative keywords for the target words and assess their practicality on a scale from 1 to 5 (where 5 represents "the best").

ChatGPT can help in finding alternative words or rating target phrases by providing terms, translations, synonyms, examples, antonyms and colloquialisms in multiple languages (Cointelegraph, 2021; Jiao et al., 2023). While Engber's taxonomy highlights lexical errors, it does not offer alternatives or acceptance ratings. However, utilising ChatGPT as a tool for suggesting and rating alternative words can improve and refine lexical choices.

Kohnke et al. (2023) conducted a research on ChatGPT as a language teaching and learning aid provided examples of learning tasks for new teachers and students and discussed challenges and solutions related to utilising ChatGPT. They emphasised that language teachers and learners need strong digital skills to utilise AI-powered tools effectively and navigate their potential risks and drawbacks.

To maximise the benefits of ChatGPT in language learning, Kohnke et al. (2023) encouraged language educators to explore its educational potential and utilise it ethically. It is critical to ensure the reliability and accuracy of ChatGPT's offered alternatives. To identify appropriate replacement phrases, this procedure should include native speakers with advanced linguistic expertise. Furthermore, any alternative terms recommended by ChatGPT must be carefully evaluated within their specific settings to ensure they consistent with the intended meaning and style of the text. By following these rules, trainers can improve language learning outcomes while maintaining high standards of reliability as well as accuracy.

## 4. Results

#### 4.1. A Comparison of the Students' Writing

I analysed and compared 27 writing samples from weeks 1, 3, and 5, choosing three learners: Learner A from group 1, learner B from group 2, and learner C from group 3. Each learner completed nine writings: three for each condition in week 1, three in week 3, and three in week 5. To ensure that the sample represented all skill levels, I gathered three examples of each learner's writing for each condition, totalling 27 scripts (see Table 1).

The writing samples were analysed utilising Meara and Miralpeix's (2016) quantitative vocabulary size evaluation, and lexical errors were classified according to two features—lexical selection and form—based on Engber's (1995) taxonomy. The three conditions were as follows:

1. **Pushed Email Condition:** Students composed a narrative using six target words after receiving instructions from their instructor via email.

- 2. Pushed Class Condition: Learners wrote a story using six target words and received immediate feedback from the teacher in the class.
- 3. Non-Pushed Class Condition: Students used the target vocabulary to write six sentences during class, with no feedback or encouragement provided.

This study examines the three language education conditions and their potential outcomes, focusing on vocabulary size through a quantitative V\_Words analysis. The methodology section explains why alternative measurements were not used. By analyzing vocabulary size, the study aims to provide insights into the effectiveness of each educational condition.

## 4.2. A Quantitative Examination of Vocabulary Size

The pushed email condition consistently outperformed the pushed class and nonpushed class conditions when analyzing the vocabulary size of each of the 27 writing samples. Each learner contributed nine pieces of work in weeks 1, 3, and 5. In week 1, the student in group 2, who was assigned the pushed email condition, had the highest vocabulary size (VS) at 132, followed by the student in group 3 at 105, and the student in group 1 at 99. The remaining students in each group demonstrated smaller vocabulary sizes, indicating that the pushed email condition effectively enhanced vocabulary acquisition.

		Week One						
Student ID	Group	Non Pushed Class	Pushed Email	Pushed Output				
37	3	57	105	51				
21	2	66	132	70				
7	1	60	99	75				
		Week Three						
Student ID	Group	Non Pushed Class	Pushed Email	Pushed Output				
37	3	53	111	42				
21	2	66	106	66				
7	1	59	92	72				
Week Five								
Student ID	Group	Non pushed class	Pushed Email	Pushed Output				
37	3	62	80	51				
21	2	59	95	35				
7	1	54	100	60				

#### Table 2: Student Writing Sample Comparison.

This trend persisted in week three, where the student in group 2 assigned to the pushed email condition again had the highest VS at 106, followed by group 3 at 111, and group 1 at 92. The other conditions in each group demonstrated less accurate use of the target vocabulary.

In week five, although the vocabulary size of the three selected students declined slightly, the pushed email condition continued to perform well. Group 1 had a VS of 100, group 2 had 95, and group 3 had 80 in the pushed email condition. Again, less vocabulary was found in the other conditions across each group. These data indicate that the pushed email condition sustained vocabulary expansion over time.

The refinement of the data across the three groups confirms that the pushed email condition is the most advantageous. Pushed email consistently resulted in larger vocabulary sizes compared to the other conditions across all categories.

#### 4.3. A Qualitative Analysis of Lexical Errors in the Students' Writing

Word mistakes are one of the most common error types made by second-language learners. These errors can affect the correctness, clarity, and appropriateness of communication and reflect learners' competency and progress. Engber (1995) categorized lexical mistakes into two main categories: lexical choice and lexical form. Lexical choice involves selecting words that accurately convey the intended meaning, while lexical form encompasses errors in word structure, including verb forms, derivational mistakes, and spelling. In this qualitative study, I applied Engber's taxonomy to analyze students' writing samples and highlight issues in both lexical choice and form. Errors in lexical choice included selecting incorrect words or phrases, while errors in lexical form involved mistakes in verb forms, derivation, and spelling.

Excel data coding revealed 30 lexical mistakes in 27 learners' essays. Week 1 lexical choice mistakes for group 1 included:

#### In Week 1, Group 1:

1. Verb forms: "While their instructor disapprove of the work they did in the face of the entire class." (pushed class)

Misuse of 'disapprove' instead of 'disapproves'.

2. Combinations: "She did not usually heed the warnings of beware of others and she planned to make a benefit of him". (pushed email)

The erroneous usage of 'heed the warnings of beware of' in place of 'heed the warnings to beware of' or 'heed the warnings about' to convey caution.

3. Individual lexical items: "They usually get a low rate on assignments and tests". (pushed class)

The erroneous usage of 'rate' rather than 'score' or 'grade' for assignments and tests.

#### In Week 3, group 1:

1. Verb forms: There was an error from a student: "He started highlight the vocabulary". (pushed class)

Mistake: The verb form employed in the sentence. The appropriate verb form is 'highlighting' rather than 'highlight.'

2. Combinations: A student made an error with "If the combine did not do endeavours." (pushed email)

A mistake was made in the collective endeavours by using the word "combine" rather than "they did not combine."

3. Individual lexical items: There was an error with "Editing helped Ali to understand resolution to his writing". (pushed class)

Mistake: The incorrect use of 'resolution' rather than enhancement'.

#### Week 5, group 1:

1. Individual lexical items: There was an error with "I would like to assist and soak the most knowledge as possible". (pushed class)

Mistake: The incorrect use of 'soak' rather than 'acquire' concerning getting knowledge.

2. Combinations: There was an error with "Instructor announced that they were searching for assists and volunteers with an institution project that demanded good

language skills". (pushed class)

Mistake: The incorrect use of 'assists' rather than 'assistance' concerning volunteering for an institution project.

3. Verb forms: There was an error with "I expected the isolated animals from their natural environment". (pushed email)

Mistake: Lexical form mistakes arise when a lexical item or portion of a word deviates target language norms. Examples include spelling, prefixes, suffixes, and word construction. The past participle of the adjective 'isolated' should be used. 'Isolated' signifies 'separated' or 'minimal contact.' 'Isolate' signifies 'separate from other individuals' or 'minimizing contact with other individuals'. I expected the creatures to be separated from their natural habitat as a result of human activity.

Additionally, a typographical error was observed in the non-pushed class:

4. Spelling mistake: There was an error with "My father tasted a lemon for the initial time, and he found it to be excessively sourd."

The qualitative study shows students' lexical faults throughout instructional conditions and timeframes by offering particular instances inside every group, such as inappropriate word use, incorrect word pairings, and spelling problems.

The pushed class student in group 1 made verb form lexical form mistakes in weeks 1 and 3. No mistake occurred in week 5. Over many weeks, there was an increase in the number of lexical form mistakes regarding verb usage in the pushed class.

Engber's (1995) taxonomy of lexical mistakes was used to analyse group 2 students' lexical errors.

Week 1, group 2:

1. Individual lexical items: There was an error with "As the market began to wreck, Fahed investment's value begins to decrease". (pushed email)

Mistake: The incorrect use of 'wreck' rather than 'crash' concerning the market.

2. Verb forms: There was an error with "The costs could varying greatly from day to another one". (pushed email)

Mistake: Instead of varying', 'vary' should be used.

Week 3, group 2:

1. Individual lexical items: There was an error with "A student may have underlined significant points her resolution and edited their paper". (pushed email)

Mistake: 'resolution' does not fir the meaning or context. Language flaws impede communication. 'Improvement' should be used here.

2. Combinations: An error was made with "I discovered a machine that could to operate autonomously; it was fantastic." (pushed output)

Mistake: Incorrect use of 'that could to operate' in place of 'that could operate'.

3. Verb forms: There was an error with "He might simply have highlight the significant areas". (pushed email)

Mistake: Lexical form - when a word or portion of a word defies the norms of the target language, verb form errors occur: The word 'eliminate' should be deleted.

Week 5, group 2:

1. Individual lexical items: There was an error with "The actor and my brother's recommendations could sometimes defy and they could become annoyed". (pushed email) Mistake: The incorrect use of 'defy' rather than 'differ' with recommendations.

2. Verb forms: There was an error with "She demand isolated herself in a quite area to learn for test". (non-pushed class)

Mistake: Word form mistakes arise when a word or portion of a word violates target language rules. Nouns instead of verbs, improper tense use, and number. The example misuses 'isolated'. The basic verb 'demand' requires an infinitive. The past participle of 'isolate'—'isolated'—is inappropriate here. The correct wording should be 'She demanded to be isolated in a quite area to learn for the test'.

Examples of lexical mistakes in this study include verb form and item mistakes. There were mistakes in the non-pushed class condition, the pushed class condition, and the pushed email condition in weeks 1, 3, and 5, reflecting student errors in different circumstances. The participant in group 2 of the pushed email made lexical form errors in verb form in weeks 1 and 3. Week 5 had no error. This shows verb lexical form problems across the weeks in the pushed email class.

The next part analyses the student from group 3's lexical mistakes qualitatively using Engber's (1995) taxonomy.

#### Week 1, group 3:

1. Individual lexical items: There was an error with "An instructor had to beware of the students' cheating". (pushed class)

Mistake: Writers make lexical choice mistakes when they use the wrong word or phrase. 'Beware' implies 'be safe from'. It is not relevant to the teacher's awareness of cheating. Understanding—be aware of—is correct.

2. Derivational errors: There was an error with "Mona learnt the essential of forgive and letting go of her adverse ideas". (pushed email)

Mistake: The verb 'forgive' is used incorrectly in place of the noun 'forgiveness'. The correct sentence should be "Mona learnt the essence of forgiveness and letting go of her adverse ideas."

3. Verb forms: There was an error with "An instructor requests me to provide rate to book". (non-pushed class)

Mistake: The incorrect use of 'provide a rating to' rather than 'rate' concerning a book.

#### Week 3, group 3:

1. Individual lexical items: There is an error from a student which is "An instructor accepted and she began to operate on an idea to assist her". (pushed class) Mistake: The incorrect use of 'operate on' rather than 'work on' concerning a plan.

#### Week 5 for group 3:

No mistakes found.

This study highlights lexical problems related to verb forms, derivation, and specific lexical elements across different instructional conditions, including pushed class, non-pushed class, and pushed email, as well as across different time points—weeks 1, 3, and 5. These examples illustrate student errors in various contexts.

The absence of mistakes in Group 3's writing in week 5 suggests that their lexical choices and forms improved over time. Specifically, the participant who had made individual lexical item errors in the pushed output class demonstrated significant progress by week 5. Although errors were identified in weeks 1 and 3, they were successfully corrected by week 5.

#### 4.4. Detailed Analysis of Samples of Students' Writing

The effectiveness of different language education methods can be understood by comparing writing excerpts from a pushed email class, a non-pushed class, and a pushed class. The pushed email condition consistently increased vocabulary size across all 27 writing samples. Each learner produced three writing pieces for each condition, totalling nine samples. The pushed email condition also illustrated a significant improvement in vocabulary accuracy.

The purpose of this qualitative study was to identify and characterise L2 learners' lexical errors in student essays utilising Engber's (1995) taxonomy, which categorises errors based on lexical choice and form. Common mistakes included inappropriate word usage, misspellings, and verb form errors. The investigation showed frequent errors across various teaching conditions and time periods. However, it was also noted that some learners showed development in their lexical choices and forms with time.

## 5. Discussion

#### 5.1. Comparing Examples of the Student's Writing

This section investigates how different instructional methods—pushed output, non-pushed output, and pushed email—affected the vocabulary development of language students. The study analysed 27 writing samples collected over weeks 1, 3, and 5, focusing on three learners: Learner A from group 1, learner B from group 2, and learner C from group 3. Each learner completed nine writings: three for each condition in week 1, three in week 3, and three in week 5. Meara and Miralpeix's (2016) recommendations were utilised to quantify vocabulary size, while Engber's (1995) taxonomy was applied to qualitatively assess lexical mistakes in the writing samples.

The quantitative findings illustrated that the vocabulary size (VS) in the 27 writing samples favored the pushed email condition, in which learners wrote stories utilising six target words and received instructor feedback via email. The results showed that the pushed email condition promoted and maintained vocabulary utilise more effectively than the pushed output and non-pushed output conditions.

Research has found that accelerated output and feedback are beneficial for secondlanguage (L2) learning. According to Swain (1985), pushed output requires learners to use their language skills beyond their existing level, while feedback assists learners identify and correct their mistakes (Long, 1996). Both output and feedback enhance students' focus, awareness, and metalinguistic knowledge, thereby promoting language improvement (Lyster & Ranta, 1997; Sadeghi Beniss & Edalati Bazzaz, 2014; Swain & Lapkin, 1995).

According to the current paper, the method of delivering pushed output and feedback can significantly impact their effectiveness. The pushed email condition, which involves written communication between students and instructors, produced better findings than the other two conditions. Specifically, the pushed email condition may:

- Provide learners with extended time to process information, generate output, and receive feedback without the pressure of real-time interaction (Warschauer & Healey, 1998), and allow learners to self-correct and revise, potentially improving accuracy (Nazari & Niknejad, 2015).
- Enable students to store their production and feedback for later review and revision at their own pace (Warschauer & Healey, 1998).
- Promote a more personalized, learner-centered approach to education that meets students' individual needs, preferences, and learning styles (Blake, 2000).

This study quantitatively verified that pushed email improves L2 vocabulary acquisition. The asynchronous nature of textual communication may be advantageous for the transmission of output and feedback. These results help to our understanding of how intake, output and feedback promote language development and offer practical strategies for utilising technology to improve vocabulary in language instruction.

The paper's qualitative lexical error analysis shed light on L2 learners' lexical mistakes and their language learning progress. Lexical mistakes, consisting of errors in choice and form, are prevalent and affect communication accuracy, appropriateness and clarity. These mistakes were categorised and analysed utilsing Engber's (1995) taxonomy.

Lexical form mistakes, notably in verb forms, were identified across the 27 writing samples from weeks 1, 3, and 5. Both the pushed email and pushed class learners made verb form mistakes in weeks 1 and 3, but not in week 5. This illustrates that lexical form accuracy enhanced over time in these conditions, likely due to the comments by instructors in class or via email.

Regarding vocabulary size, the pushed output class had better than the nonpushed output class. Unlike the non-pushed output class, both the pushed output class and the pushed email class showed development in form accuracy as well as lexical choice over time. The learners received feedback in the pushed email and pushed class conditions, but not in the non-pushed class condition. This indicates that feedback played a major role in the observed developments.

These findings consistent with prior research, which suggests that feedback and exposure are significant factors in acquring L2. Feedback assists learners in identifying and correcting mistakes (Long, 1996), while exposure, as defined by Ellis (2008), involves any form of output or input that allows learners to engage with the target language. Both exposure and feedback enhance language improvment by increasing understanding, attention and metalinguistic knowledge (Lyster & Ranta, 1997; Swain & Lapkin, 1995).

In the pushed output email class, a learner in group 1 illustrated a sophisticated understanding of the target term "classify" by correctly utilising its various forms— classification, classified and classify —throughout week 5. This illustrates that the learner had internalised the meaning, usage and word formation processes of "classify," consisting of derivation and suffixation. Word formation processes, as James (2013) explains, are essential for vocabulary expansion, affecting meaning, word structure and grammatical class.

Previous studies confirms the results of the paper regarding word formation processes in L2 vocabulary acquisition. Understanding word formation assists L2 students grasp word structure and relationships, which is important for improvement and lexical competence (Laufer & Waldman, 2011). Inferring the meaning and utilise

of new words from their morphology can help vocabulary improvement (Schmitt & Zimmerman, 2002).

In the course of week 5, a learner in group 2 made a lexical error by utilising the word "defy" instead of "differ" or "conflict" in the pushed output email condition. This kind of mistake appears when a word is utilised that does not fit the sentence context. "Defy" means to challenge, resist or oppose, whereas "differ" and "conflict" refer to disagreement or incompatibility. The correct sentences would be:

- "The actor and my brother's recommendations could sometimes differ, and they could get annoyed."
- "The actor and my brother's recommendations could sometimes conflict, and they could get annoyed."

Several factors might have contributed to this error:

- L1 Transfer: The learner may have chosen a word similar to one in their first language but incorrect in the target language.
- **Overgeneralisation:** The student may have applied a linguistic pattern correctly in some contexts but not in others. "Defy" could have been utilised as a simplified form, based on the prefix "de," which is commonly utilised to generate opposing or negative verbs.
- **Simplification:** The learner might have indicate a simpler or more common word, which might convey incompatibility or disagreement. Additionally, the learner utilised "defy" correctly in another context, illustrating a comprehension of its function and meaning. Laufer and Waldman (2011), nevertheless, argue the the learner's lexical performance and understanding may be inconsistent.

The current paper's sample size was relatively small, with 27 writing samples gathered across weeks 1, 3, and 5, concentrating on three learners: Learner A from group 1, Learner B from group 2, and Learner C from group 3. Each learner completed nine assignments: three for each condition in week one, three in week three, and three in week five. As a result, the findings may not fully represent the variability of language students in different contexts. The choosing of writing examples from certain experimental points may also not represent the full range of vocabulary acquisition or account for factors such as attitudes, motivation and prior knowledge. Furthermore, a random sample from each cohort was utilised, which may not have ensured that the sample was representative of all proficiency levels or vocabulary learning variables. Further research is required to confirm and extend these results.

Despite these constraints, the study of learner essays confirms the hypothesis that pushed output email classes can improve vocabulary learning. Nevertheless, further research is important, particularly to explore how implicit or explicit feedback (Ellis, Loewen, & Erlam, 2006) or diffuse versus targeted input (Sheen, Wright, & Moldawa, 2009) effect vocabulary improvment.

# 6. Conclusion

This study examined the effectiveness of pushed output delivered via email, pushed output in a classroom setting, and the lack of pushed output in a classroom setting. The results showed that the pushed email condition greatly improve vocabulary size

and accuracy compared to the other conditions. This indicates that asynchronous communication, such as email, provides students with valuable opportunities for self-correction and reflection, resulting in enhanced lexical competence.

The paper emphasises the advantages of integrating technology—specifically email—into language education, promoting personalised and learner-centred approaches that cater to individual preferences and requirements. These findings offer practical techniques for educators to improve vocabulary acquisition and overall language proficiency in EFL settings.

In order to enhance these findings, additional research could investigate the subtleties of various feedback kinds and their impact on vocabulary improvement.

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