



The Effects of Technology- and Non-Technology-Based Vocabulary Learning Activities on Saudi EFL Learners' Pushed Output Vocabulary Learning

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Abstract

Since the output hypothesis was originally developed by Swain (1985; 1993), it has retained its relevance for teaching and learning. Pannell et al (2017) subsequently embedded the output hypothesis firmly in language studies and teaching and saw it as critical for encouraging learning. Pushed output was defined by Ellis (2003, p. 349) as “output that reflects what learners can produce when they are pushed to use target language accurately and concisely”. Similar to the output hypothesis, technology adoption in the classroom is also becoming recognised as a viable – indeed crucial - tool for students and teachers (DFE, 2019). However, there is a gap in the research revolving around how technology and pushed output can be combined to engender improvements in vocabulary learning. This thesis will thus compare three conditions (pushed email, a pushed class and a non-pushed class) in terms of their effects on vocabulary learning. These three conditions are within-subject design, so all the participants in the study experienced the same conditions in a different order. A mixed-methods approach was used to collect the data.

The thesis used a productive test, a vocabulary knowledge scales test and a questionnaire to seek answers to the set research questions. The participants were 54 adult Saudi EFL students recruited from third-year English specialisation classes at Albaha University, Saudi Arabia. The design of the study consisted of three groups, three conditions and three target vocabulary sets to compare learners being taught via traditional methods without pushed output, learners being taught with pushed output, and learners using email pushed output. In both the productive and vocabulary knowledge scales tests, the results reveal that learners who did vocabulary learning exercises via pushed output significantly outperformed those who completed exercises without pushed output, in both the short and long terms. Moreover, the results reveal that students who completed their exercises via email outside the class using pushed output had a greater effect size than those who engaged in pushed output in the classroom. Additional analysis compared the students’ work to determine the impact of language instruction on vocabulary size and lexical errors. It analysed the students' lexical choices in their writing and the form of their errors in a pushed email, a pushed class, and a non-pushed class. It was found that pushed email resulted in larger vocabulary capacities. Both a pushed class and a pushed email were found to be optimal scenarios for improving lexical choices and form of error over time. In terms of vocabulary size, the results showed pushed email to be the optimal condition for vocabulary use vis-a-vis a pushed class and a non-pushed class.

The questionnaire confirmed that the students had positive attitudes towards using email for learning vocabulary. The results suggest additional research is needed into technology-enhanced vocabulary learning activities for speaking skills over the long term using the pushed output approach. Such studies could increase the sample size and conduct comparative research with other countries across the Middle East.

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Chapter 1. Introduction

1.0 Introduction to the Chapter

This first chapter sketches the growth of English to global importance. It then discusses the current research background on vocabulary learning and pushed output vis-a-vis non-pushed output, before looking at the links between technology and learning vocabulary. It then discusses the motivation for the current research. Section 1.4 sets out the significance of the research for field of applied linguistics. Then, Section 1.5 details the goals of the research. Section 1.6 considers the research design. Next, section 1.7 considers the contributions of the thesis to research in the field. Finally, Section 1.8 ends the chapter by setting out how the thesis is organised.

1.1 The Growth of English to Global Importance

This study seeks to aid the learning of English inside Saudi classrooms. The reason for the desire to learn English for so many KSA citizens is its place as a global lingua franca (Facchinetti, Crystal & Seidlhofer, 2010), which makes it desirable from a personal and career vantage point to learn. English has reached this dominant position globally because of its global usage in research, aviation, education, trade and technology.

Historically, the English language benefited from political expansion by Britain from the 17th century onwards, culminating in the world's largest ever empire by the end of the 19th century. Important in this expansion was the British colonisation of India, which today, with a population of 1.4 billion, uses English as an official and unifying language across its diverse linguistic communities and cultures. The conquest of North America and its inclusion into the British Empire was also crucial, setting the stage for the further expansion of the English language with the rise to global pre-eminence of American political and economic power. There are, of course, considerable variations in English, a consideration when teaching the language in the classroom. A key difference is between US English and UK English, both in spelling and the choice of words ('sidewalk' and 'pavement' being one such difference). Looking further afield, the dialects within English in the Caribbean, where English is the main language, deviates from the standard into 'patois' (where expressions such as "I and I walked together" would be considered correct). Then there are the different dialects and usages across Africa and the Indian subcontinent. Indeed, the sheer diversity of English makes it both fascinating and challenging to teach and learn.

As a language English has been a hybrid tongue. In the past, post Norman Conquest in 1066, it was the secondary language within Britain, French being the language of the court. It had previously been altered by Latin (the Romans) and Norse (Viking) before the French Influence. This only changed during the reign of Richard II in the fourteenth century, he preferred English and was a patron of the first major writer in English, Chaucer. English today remains a linguistically metaphorical magpie, taking words seemingly at will from other languages – for example bungalow and shampoo both have their origins in Hindi.

During the era of Empire, and today as a consequence of that era, elites from many of the colonised regions sent/send their children to England to study, a further significant factor in the rise of British educational and scientific hegemony (Al-Jarf, 2005). For the purposes of this study, UK English will be the form of the language addressed as it is this form of English taught within schools in the KSA. This is not to decry US – or any other - English, and in the KSA and the wider Arabic world there are many American Schools.

US English is closely connected to competition in business and education and encouraged the rise of America to world commercial and then military and political dominance, with many of the 20th century's inventions emanating from the minds of American and UK scientists and entrepreneurs, such as electricity, the combustion engine, and, more recently, the Internet. The use of English as a common thread has helped scientists in countries such as India connect with the West easily, and the demand to learn English has created something of a boom in online classes for those in China, Hong Kong etc.

Throughout these aforementioned historical transformations, communication in English has allowed transcultural interchange among different countries in a once fragmented world that suffered from linguistic obstacles to universal understanding, business, and exchange of experiences. Today, although challenged by a number of regional lingua francas, English remains the undisputed global lingua franca, replacing previous languages that held that role – notably Latin.

1.2 Research Background

It is widely acknowledged that learning vocabulary in a second language is essential for attaining communicative competence and mastering a language (Schmitt, 2008), as well as being a strong predictor of a learner's reading comprehension skills (Nation, 2001). However, Webb and Chang (2012) argued that learners are slow to increase their lexical breadth (the number of

words in their lexicon), and teachers often do not dedicate large amounts of class time to the teaching of vocabulary (Waring & Nation, 2004).

Swain (1985) suggested that if a learner is ‘pushed’ to produce a target language, via certain immersion techniques, they have a greater potential for noticing any lexical gaps that may exist between their intended utterance and what is actually spoken. Willis (2003) sees these ‘gaps’ as caused by ‘improvisation’ – the learner being able to infer rules and meaning in the new language, but communicating inaccurately in many instances. An important part of the identification of the gap when speaking is the development of metalinguistic abilities. This means the student is able to reflect on what he/she is producing and identify where the errors are being made. At the same time, as Stetsenko and Arieviditch (1997) suggested, these abilities may develop when engaged in cooperative collective behaviours with other people and become internalised later as the student recognises his/her errors and strives to correct them. The key factor here linking the threads is that the language immersion creates the ‘push’ – the learner cannot revert to their first language.

To explain the focus of the current work, a distinction between pushed and non-pushed output must be made. Non-pushed output is where a learner is asked to produce a sentence, but either a direct correction is made, removing the learner's own potential to consider and correct the error, or no correction is made at all, which means the learner is not directed to the correct production.

Pushed output, in contrast, is the use of strategies to encourage learners to notice where they have made an error, reflect on this error and self-correct (Swain, 1985, 1993; Byrne and Jones, 2014). Examining these differences, it can be proposed that pushed output contains more substantial potential to develop overall skills in language because of the focus on encouraging learner self-awareness of errors and self-correction. This occurs due to the fact that the learners are placed in a situation whereby they have to use the new language; they cannot remain in a safety zone of their home language alongside others all speaking their home language as well.

The advantage of pushed output and examining how it can be applied alongside technology is that it encourages reflection on what has been input. Given the increasing use of working and learning from home in 2020/2021 due to the COVID-19 pandemic, the use of technology has become even more topical and important for researchers into teaching and learning. Email contact may improve language learning and teaching. Nazari and Niknejad (2015) suggest that email allows students to self-correct and revise, improving accuracy. Ware and Warschauer

(2006) further suggest that technology gives students a permanent record of their production and feedback, which they may revisit and improve at their leisure. Blake (2000) also notes that technology makes training more personalised and learner-centred, catering to students' diverse needs, preferences, and styles. Technology may improve students' language development and motivation.

In this research, pushed output means learners are "pushed" to produce while using correct, concrete, appropriate, and exact language (Swain, 1985). Ellis (2003, p.349) defined pushed output as "output that reflects what learners can produce when they are pushed to use target language accurately and concisely". Pushed output will be used in this sense throughout the study. As noted, technology in language learning and instruction supports pushed output. Email communication allows students to self-correct, revise, and examine their work and feedback at their own speed (Nazari & Niknejad, 2015; Ware & Warschauer, 2006). Technology also accommodates students' different requirements, preferences, and styles (Blake, 2000). Thus, technology improves language growth, motivation, and pushed output, enabling learners to use the target language concisely and accurately.

In addition, it has been suggested that technology can support pushed output and encourage the development of accurate output as well as expand existing levels of vocabulary knowledge (Allagui, 2014; Avcı, & Adiguzel, 2017). The suggestion is that technology (online conferencing, blogs and emails among others) can increase vocabulary and encourage pushed output by stimulating the need for a response in a less formal way than in structured, non-technology-based classroom teaching. In other words, there may be value in using tools of technology in the classroom to encourage students to give online responses to task sets by the teacher via email (specific for this research) and return their answers by email (i.e. pushed output encouragement).

This study compares the effects of three different conditions of vocabulary learning activity on the vocabulary development of adult Saudi Arabian English as Foreign Language (EFL) learners. Specifically, using the first two conditions of Swain (2000), it examines the effects of one technology medium adopted as a tool to encourage pushed output, as opposed to the synchronicity of learning via pushed or non-pushed output in the classroom. In other words, the focus is on comparing pushed output through the use of email technology (feedback that encourages self-correction through technology) and pushed output without technology.

Each experimental group in the study receives the three conditions in a different order. One condition receives pushed output in the classroom. A second receives pushed output by being sent five words via email which must be used appropriately in the form of a story based on a context provided by the teacher (returned either by handing in or by email). The third condition has neither pushed output nor technology. In relation to feedback, Long (1996) defines feedback as any information that helps students recognise and remedy their errors. Swain suggested that it encourages learners to adapt their language, leading to language production playing the main role in the learning process (Swain, 2000). The pedagogical rationale for the approach is that asking students to use the target words in a story format makes the activity more meaningful. As Wong and Looi (2010) noted, providing meaning in EFL activities enhances not just engagement but also long-term retention of the vocabulary items.

An additional important construct for the current work is that of technology enhanced learning. This term refers to a formal or non-structured learning approach which combines digital media, such as email, with traditional classroom methods. The teacher and student will generally need to be present, although there is still some flexibility and it is not an absolute prerequisite of technology enhanced learning (Miyazoe and Anderson, 2010). The challenge is that the approach may be context dependent and it is hard to achieve an effective mix of digital and non-digital teaching approaches. In other words, it examines how pushed output via technology may enhance vocabulary learning when compared to non-pushed output without the use of technology.

The value of focusing the work in the Saudi context is that the Saudi Ministry of Education (MoE) encourages and supports the use of the English language due to its importance in different academic fields (Ur Rahman and Alhaisoni, 2013). The English language is considered to be a major factor in the establishment and sustainability of ongoing economic relations with the rest of the world. While the MoE's efforts are evident, learners at Saudi public schools nevertheless experience many obstacles, attributable to various factors, the most important of which, according to some scholars, is that learners are not motivated to learn English, possibly due to a lack of awareness of the career benefits having a second language can lead to (Rajab & Al-Sadi, 2015; Moham-med, 2015). Furthermore, Saudi EFL students have traditionally been taught in highly prescriptive, teacher-centred ways (Al-Zahrani & Rajab, 2017). This has led to both a lack of enthusiasm and motivation and poor outcomes in terms of vocabulary learning and overall communicative competence (Alrabai, 2016). Given the government's focus on encouraging improved English skills, combined with the high popularity of email and other online

communication mediums in the country, there is real value in investigating the role of technology in enhancing vocabulary learning in the country. This can link well to changing education in, for example, the UK, where remote learning via mediums such as Zoom have become an increasing standard through the last two years, and adult tuition has been adapting to home study through technology. Furthermore, as Han and Keskin (2016) noted, being able to converse online and try out new vocabulary items in a digital environment via instant messaging application creates less pressure than does a more formalised classroom approach, increasing confidence in the students' ability to self-correct or edit their output.

1.3 The Motivation for Research

The motivation for the current research developed from my experience as a lecturer in the English Department at Albaha University, Saudi Arabia, where the English language is taught as a foreign language. I discovered that my students have problems in learning English vocabulary in terms of verbs and abstract nouns. As I hypothesised that teaching styles and pedagogical technology were playing a role in this, I used certain steps to include technology and incorporate other teaching styles into my teaching. Firstly, I sought to explore the influence of technology to examine the extent to which educational messaging applications like email were having on the students' writing. Next, I expanded my research field to learning EFL more commonly and pedagogical technology use in particular because existing research in the field seemed to be limited in many regards. Thirdly, I planned to use input and output and (in particular pushed output) with my students to serve the learning of English vocabulary.

I discovered that different approaches could be utilised to examine the topic when I explored additional information about the problem, which also led me to identify a lack of studies on the learning of vocabulary where the focus has been on learning and testing vocabulary knowledge through pushed output with English language undergraduates across post- and delayed post-tests (for details of these studies, see Section 3.5). Furthermore, after searching for studies on pushed output and filtering the results for work in the Saudi context, I discovered that no study had been conducted on technology-enhanced vocabulary learning activities that focus on the pushed output approach to learning with English language undergraduates at a Saudi university. The current research aims to fill this gap. It is also innovative in utilising the pushed output hypothesis proposed by Swain (1985) to design course materials and test vocabulary through productive and receptive knowledge. This contrasts with existing Saudi-based studies, which have utilised the teaching in interaction hypothesis when using technology. Overall, it is helpful

to consider whether there are barriers for second language (L2) learners using messaging technology in learning English vocabulary in the Saudi Arabian university setting.

Although other areas of study – i.e., those on technology and language and pushed output – have been examined independently (Razak et al, 2013; Alsaleem, 2013; Allagui, 2014), in terms of global contribution and the vast body of research on language learners, just one study has examined pushed output with messaging application technology and vocabulary learning with undergraduates. However, this study focused on Spanish learners acquiring the meaning of nouns (De la Fuente, 2003), while the current study, in contrast, centres on learners learning English vocabulary (for details of these studies, see Section 3.5).

Furthermore, the study also fills a context gap in being conducted in Saudi Arabia, where traditional teacher led lessons within the classroom are the norm. The introduction of technology to enable different routes into learning is relatively new in the KSA language classroom, and this paper addresses the specifics of English language learning, in contrast to the studies of Razak et al (2013) and Allagui (2014), which were based on Spanish learners. This PhD project uses a mixed methods approach to compare the effect of technology in learning English vocabulary for writing in English major intermediate undergraduates at a Saudi Arabian university, using post- and delayed post-tests. Only one study has been conducted in the Saudi context, but Al-Ahdal and Alharbi's (2021) research focused on collaboration as group activities instead of individual activities, differing markedly from this paper's focus on the individual. Moreover, Al-Ahdal and Alharbi (2021) used only post-tests without delayed post-tests. The current study uses both post- and delayed post-tests because the latter measure the retention of students' lexical items. After all, the essential point of learning vocabulary is to retain it for use over the long term.

Overall, I came to the conclusion that it is vital that as much as possible is done to help Saudi undergraduates develop their knowledge of English by learning English vocabulary. Therefore, I thought it was imperative that I utilise the chance provided by the PhD thesis to contribute to Saudi students' education by investigating potential education materials and approaches that can be efficiently and systematically implemented throughout higher education in Saudi Arabia.

1.4 The Significance of the Research

The significance of the current study is that it examines the effectiveness of two types of pushed output vocabulary learning activity and one type of non-pushed output activity on the learning of English vocabulary by Saudi Arabian undergraduate EFL learners in the short and long terms

in terms of verbs and abstract nouns. Moreover, it explores their experiences and attitudes to using technology (email) for learning English vocabulary.

The context for this study is the low quality of English language learning in Saudi Arabia, where traditional face-to-face teaching methods continue to dominate and are not supplemented by self-study activities. This study seeks to investigate how modern technologies, such as email, may enhance vocabulary learning and academic achievement in Saudi Arabia by providing opportunities for pushed output. In fact, there is a lack of research on the effects of pushed output in Saudi higher education, particularly within English departments. This study aims to address the gap in the literature by investigating whether email-based activities can promote pushed output and vocabulary development among English majors in the country. In addition to understanding the attitudes and experiences of language learners regarding the use of technology for language learning, the research aims to provide policymakers and educators with recommendations for integrating technology into the curriculum. The findings of this study may have implications for other contexts in which ESL or EFL is taught, particularly in light of the Covid-19 pandemic, which has compelled a large number of teachers and students to embrace online modalities of instruction.

The main goal of this study is to investigate the short- and long-term effects of technology-mediated pushed output on the vocabulary learning of adult ESL learners, focusing on verbs and abstract nouns, writing skills. This study is a significant contribution to the field because it fills several gaps in the existing literature and offers a number of novel insights. Previous studies that have examined technology and language learning include: Arnot et al.'s (2014) paper for the Refugee Council, which was school based and considered school EAL pedagogy, making links to incorporating technology but not specifically pushed learning; and Al-Ahdal and Alharbi's (2021) study, which focused on collaboration as group activities rather than individual activities, and on the short term in the f2f context. This PhD dissertation will address a number of extant gaps in the literature and some issues that have not received the attention they merit, if any. As previously mentioned, there is a lack of research on the vocabulary learning of university ESL students which concentrates on learning and testing vocabulary knowledge via pushed output over the short and long term. In addition, the dissertation is innovative in its application of the pushed output hypothesis in conjunction with technology (email) to design course materials and assess vocabulary using vocabulary knowledge scales and a productive knowledge test. In these ways, it is anticipated that this study will make original contributions to the relevant pedagogical literature.

1.5 Goals of the Research

The research has the following four goals:

- To determine the effects of pushed output on learning English vocabulary for Saudi adult EFL students in the short and long terms.
- To evaluate the role of pushed email and its contribution to language learning in the short and long terms.
- To compare and contrast the effects of email and pushed output on learning English vocabulary for EFL Saudi students over the short and long terms.
- To explore students' experiences and attitudes towards studying vocabulary using email as part of a technology-enhanced learning approach to learn vocabulary.
- To compare the vocabulary size of students under different conditions (pushed email, pushed class, and non-pushed class).
- To measure changes in lexical choices and forms over time for students in various conditions.

1.6 The Research Design

This thesis is divided into two phases. The first stage is a quasi-experimental examination of the effects of pushed output on English vocabulary learning in terms of verbs and abstract nouns under three conditions (pushed email, pushed class, and non-pushed class). It also investigates the role of technology in vocabulary learning and the impact of pushed output and technology when combined. The second stage is a mixed-methods case study that examines students' attitudes towards email as a technology-enhanced instrument for vocabulary development. It collects data using Likert scales and open-ended questions and compares the use of assigned vocabulary in students' writings at different stages of the experiment (see Chapter 4 for detail on the study design).

1.7 Research Contributions

The current study's outcomes support existing knowledge on the delivery of educational technology in learning English vocabulary in terms of verbs and abstract nouns to develop writing. This can be seen from the results in Chapter 5 and the subsequent discussion in Chapter 6. In addition, the outcomes make a direct contribution to knowledge in both theoretical and practical directions. The outcomes could be drawn on to stress how the inclusion of technology with pushed output in EFL classrooms can aid learning at Saudi universities. Other goals include comparing the vocabulary size of students in different conditions (pushed email, pushed class,

and non-pushed class) and measuring the changes in lexical choices and forms over time for students in different conditions. Extensive experience with and attitudes to utilising educational technology's affordance are determined to develop academic knowledge. Many previous studies that have been conducted on non-English majors have made novel contributions, but few have focused on students taking an English major, so this is an area relatively novel and ripe for research purposes (the study's contributions are explained in more detail in Chapter 7).

1.8 Structure of the Thesis

The thesis is organised as follows:

This first chapter has sketched the growth of English to global importance, set out the research background and motivation for the study, identified its significance for the academic field within which it is located, set out its goals, its research design and the contributions of the thesis to research in the field, before ending by noting out how the thesis is organised.

Chapter two covers the context and conceptual framework, and is divided into four parts: 1) Teaching the English language in Saudi Arabia and kinds of language schools in the country; 2) teaching the English language in Saudi universities and teaching the English language via technology with pushed output; 3) vocabulary instruction, including academic vocabulary and the four skills of listening, speaking, writing and reading; and 4) the essence of testing vocabulary knowledge.

Chapter three, in seventh parts, provides a review of the relevant literature. The first part covers vocabulary knowledge, including vocabulary breadth and depth. The second part looks at the L2 mental lexicon. The third part discusses vocabulary learning and measuring L2 vocabulary. The fourth part covers input versus output, including functions of output in learning second language vocabulary. The fifth part conducts a literature search of pushed output and technology used in learning vocabulary, comprehension versus production and the testing effect. The sixth part addresses CALL technologies and specific mediums, namely assistant language learning and vocabulary and messaging applications in pushed output and pedagogy, and justifies why this technology is used. The final part identifies the research gap that this study aims to fill.

Chapter four sets out the research methodology in 12 parts. The first four parts set out the research questions the study seeks answers to, considers the study's philosophical underpinnings and research design, and explains the study's participants. The next four parts set out the study's dependent and independent variables, tests and materials, including the productive knowledge

and the vocabulary knowledge scales, the data collection and the quantitative data analysis. The final four parts look at qualitative data analysis, the questionnaire, the reliability of the study, its validity, the ethical issues raised, and the pilot study undertaken prior to the main research.

Chapter five gives the study's findings. This chapter includes a productive test analysis, a vocabulary knowledge test analysis, comparative examination of student writing examples, a questionnaire analysis, and a qualitative analysis linking the questionnaire results to the test scores. The first and second sections of this chapter - productive test and vocabulary knowledge test analyses - explain the differences across the three conditions (pushed email, a pushed class, and a non-pushed class) in terms of productive and receptive vocabulary knowledge. The third section analyses comparative examination of student writing examples. The fourth and fifth sections give a quantitative and qualitative analysis of the questionnaire, exploring the students' experiences of and attitudes towards using email in learning English vocabulary. The sixth and seventh sections look at the advantages and disadvantages of using email in learning English vocabulary. Finally, the chapter ends with a qualitative analysis linking the questionnaire results with the test scores. These findings allow the researcher to confirm the extent to which, if at all, learning English vocabulary via pushed output using email facilitates students' learning of English vocabulary.

Chapter six expands on the findings in the previous chapter and links them in the light of existing research in the field. The chapter begins with a discussion of the main outcomes and their importance, before continuing by answering the first main research question and testing the hypothesis on pushed output in learning vocabulary. Moreover, the chapter answers the first two sub-questions of the first main research question, which explore, namely, technology in learning vocabulary and pushed output and technology in learning vocabulary. In order to address research questions and test hypotheses, the chapter also examines comparative analyses of student writing samples. The chapter also expands analysis on the questionnaire's results to answer the second main research question, which explores students' experiences of and attitudes towards using email in learning English vocabulary. The chapter ends by identifying a number of implications of this study.

Finally, chapter seven begins by re-evaluating the research objectives and questions. It then reviews the central outcomes and the discussion of the previous chapter. Next, a number of the study's contributions and limitations are considered. The chapter then offers some suggestions for additional research and ends with some individual reflections on the research journey.

1.9 Summary of the Introduction Chapter

Section 1 of this introductory chapter explained the growth of English to global importance and set out the current research's background on vocabulary learning and pushed output vis-a-vis non-pushed output, before looking at the links between technology and learning vocabulary. Section 3 discussed the motivation underpinning the current study. Section 4 then considered the importance of the thesis for the field of applied linguistics. Section 5 set out the research objectives, before Section 6 explained the two-phased research design using quantitative and qualitative methods. Next, Section 7 sketched the study's contributions and noted that they will be set out in more detail in the concluding chapter of the PhD thesis. Section 8 ended the chapter by setting out how the thesis will be structured. The next chapter considers the context and conceptual framework for this PhD research project.

Chapter 2: Context and Conceptual Framework

2.0 Introduction to the Chapter

This chapter contains four main sections, dealing, respectively, with an overview of Saudi Arabia and its system of English language teaching, teaching English via technology and pushed output, vocabulary instruction and, finally, the essence of testing vocabulary knowledge. Before the research is conducted, the first and second sections look at cases of English language teaching in Saudi Arabia and kinds of English language school in the country to set the study's context and get an overview of, firstly, the system of English language teaching, in particular at universities, and secondly, teaching English via technology and pushed output in Saudi Arabia. The third section scrutinises vocabulary instruction in English academic writing vocabulary learning tasks. This section adds an explanation of which skills play a major role in learning vocabulary and retaining it in learners' memories. The final section ends the chapter by discussing the essence of testing vocabulary knowledge.

2.1 Saudi Arabia: An Overview

Founded by King Abdulaziz bin Abdulrhman Al Saud and his army in 1932, the Kingdom of Saudi Arabia (henceforth Saudi Arabia) is located in the Arabian Gulf, linking Africa and Asia. Saudi Arabia has an area of 2.15 million km², with large open desert spaces dividing its main cities. To the north are Iraq and Jordan. Along the western Arabian Gulf Saudi Arabia shares borders with Kuwait, Qatar, Bahrain, and The United Arab Emirates. Oman is located to the south east of Saudi Arabia and Yemen to the south. The country's western border is the Red Sea. The country consists of 13 provinces, comprising 43 directorates and governorates (see Figure 1).

Figure 1: Map of Saudi Arabia



According to the General Authority for Statistics (2019), the population of the kingdom of Saudi Arabia is currently 34,218,169 million (of which 20,120,029 are Saudi citizens, the rest being migrant workers) and there are 1,982,722 university students and 6,257,784 Saudi Government school students (see Section 2.1.1) (the General Authority for Statistics, 2019). Men and women are nearly equally proportional, and a prominent characteristic of the people is that just three per cent of the population are older than sixty-five years of age, with the majority being between fifteen and fifty-four years old (CIA Factbook, 2014). Most Saudi citizens come from Arabic tribes and families in the Arabian Peninsula, including major tribal groupings such as the Adnan and Qahtani tribes. Other ethnic groups came originally from Islamic families from different nations, such as, for example, Afghanistan, China, Pakistan, Malaysia and Indonesia, who travelled to Makkah Almukaramah city as pilgrims and settled there. Today, the Arabs of Saudi Arabia are recognised not by ethnic characteristics but by tribal association for the majority of Saudi parts. In contrast to the perceptions in the mainstream media that Saudi Arabia is a homogeneous and conservative society, the twenty-first century Kingdom has undergone many social and economic reforms which have created is a multi-faceted mixture of different cultures and a fascinating blend of modernity and tradition.

It is essential to consider the economics of Saudi Arabia as a context as it has a great impact on the country's educational policy. The status of Saudi Arabia as a leader of one of the 20 Oil Petroleum Exporting Countries (OPEC) has assisted it to modernise its governing methods and national infrastructure dramatically in a comparatively short period of time compared to how western countries developed and modernised. Oil has underpinned the country's economic development and comprises the vast bulk of the country's finances. However, a severe recession in the early 1990s made the country's leaders acknowledge that the economy had become overly dependent on migrant labour and that it was necessary to train up its own citizens to take jobs in every level and sector of the economy, a policy known as 'Saudisation' (Smith & Abouammoh, 2013). Later, in 2016, the Saudi government launched '2030 Vision' to transform the country from dependence on oil to a more diversified economy. In previous years, modernisation has helped increase and advance several areas of Saudi life, including education.

2.1.1 English language teaching in Saudi Arabia

Arabic is the official language of Saudi Arabia, and English has been taught since 1928 (Al-Seghayer, 2005). Since then, the pedagogical system has been transformed, progressed and developed, and the English language has also grown in importance as the scope of the pedagogical provision was improved at various levels as the commercial and industrial sectors developed (Al-Seghayer, 2014).

However, today the English language is not commonly utilised in daily communication. Its principle usage is in informal settings such as the industrial, educational and medical sectors. In fact, progress in English teaching and learning in Saudi Arabia has been sporadic, and this is largely the cause of its patchy and inconsistent use in daily communication. Khan (2011) stated that English learners rarely get the chance to practice their knowledge outside the educational environment.

The progress of the English language has been affected by many events - both positive and negative - in Saudi history, and include educational, political, social and religious factors. Some people are defacto against the very idea of teaching the English language in Saudi Arabian schools as they see it as a means by which western culture will be imported into the country (Elyas, 2011). It is reasonable to see this as a cultural restriction on the incentive to learning English, where English is seen as the language of the US and of western culture. Nevertheless, Faruk (2014) stated that the country's education policies have managed to overcome such resistance.

In the past, Turkish was taught as a foreign language as the area was under Ottoman control, and Saudi Arabia found itself part of the Ottoman Empire's Arabian Peninsula territory. After the Ottoman Empire collapsed during WWI, the Turkish language was removed from the curriculum. Thenceforth, Arabic became prominent in schools, and education became free and comprehensive.

Scholars and policymakers strove to assure that Arabic kept its sovereignty when English was later inserted into the school programme (Abuhamida, 1988), especially given the resistance by some religious scholars (Elyas, 2011). Scholars like Abuhamida (1988) accept the spread of English and hold that the roots of Arabic are so deep that the study of foreign language such as English, Spanish and French, particularly for experimental improvement and economic development, are not likely to have an adverse impact on citizens' use of Arabic. Still, in light of the views of the sceptics and critics, teaching English focused on economic and scientific texts, and references to western habits and cultures were limited (Elyas, 2008) so as to avoid 'corrupting' young Muslims (Islamia, 2005). To solve this issue, certain scientists thought that a Muslim approach must be taken that could assist learners better grasp Muslim values instead of being negatively influenced by western culture. Accordingly, designers of the English syllabus were invited to construct a syllabus based on Muslim principles and heritage (Mahboob & Elyas, 2014).

Another characteristic that has influenced English language teaching is the aspect of motivation, which is considered a major aspect while it reaches to learning new things or gaining further knowledge. At the end of the 20th century, several Saudi scholars noted a lack of motivation among Saudi students to learn English and that, as a result, competence in the language was very low in international comparison (Zaid, 1993). A lack of motivation was compounded by a failure to grasp the significance of English in actual life, especially concerning work and communication objectives. It is a matter of importance for the KSA that it can compete internationally, and with close business ties to the US and the UK those citizens with spoken English can enjoy an advantage in the job market. Learners were hence driven to remember their examinations by rote by memorising particular essentials or vocabulary instead of actually learning and understanding English (Al-Seghayer, 2014).

The situation remains that for many Saudi students, English is not a subject to be loved, but an exam to be passed, and the importance of the language in the curriculum is based on its economic significance (Massri, 2017). Most Saudis aim to work in large companies such as Saudi Telecommunication Company or Saudi Aramco Oil Company, for which English language competence is important, especially in terms of gaining a higher position and salary (Massri, 2017). The goal of teaching the English language as an L2 in Saudi Arabia was especially to produce people with enough ability to talk with non-Arabic workers. In fact, when the Saudisation programme was devised in the 1990s to increase employment of Saudi nationals in the private sector, it became mandatory for Saudis to learn English if they wanted to secure a position in a large company (Looney, 2004). Hence English remains important, if not popular.

For instance, Aramco Oil Company, which plays a major role in the economy, places a premium on English language competence. Language terms related to petroleum products tend to have a relationship with English and consequently it is essential to acquire them. Al-Sadat and Al-Ghamdi (2002) stated that the effort to promote the English language based on its economic utility was significantly stepped up as the oil sector boomed. For example, English was inserted into all Saudi Arabian common schools in 1959. A study on oil dynamics conducted by Karmani (2005) stressed the importance of the English language in Arabian Gulf 'Petro linguistics'. In addition, Cordesman (2003) stated that the Saudi military relies heavily on input from US technicians and hence the English language is crucial in that sector too.

With the discovery of oil in the 1920s, Zaid (1993) noted that the education sector developed fast, and English teachers began to be recruited from several neighbouring Arab countries (e.g. Egypt, Jordan, Iraq and Lebanon). According to the MoE (2015), successive Saudi governments

sent Saudi students abroad – primarily to the UK, the USA, Canada and Australia - to study English and improve their language skills, paying their tuition fees and giving monthly grants. Some went on to study for degrees in scientific subjects abroad, before returning home to contribute to the improvement of Saudi Arabia. As Ur Rahman and Alhaisoni (2013) stated, the significance of the English language began to increase in all sectors, most recently on the back of the growth of electronic media and the circulation of English language newspapers. Moreover, Saudi Arabia has several English language radio and TV channels.

Due to the internationalisation of the Saudi economy and society, as well as government policy, English is now considered crucial for career success (Alharbi, 2022). Recent years have brought to light the significance of English in a global context, inspiring students to learn the language in order to increase their employment opportunities and global competitiveness (Alharbi, 2022). However, Saudi Arabians initially responded slowly to this transition and lacked motivation to study English, resulting in low levels of English proficiency (Al-Nasser, 2015). This lack of motivation was exacerbated by a lack of understanding of the significance of English in daily life, especially in the context of employment and communication (Al-Nasser, 2015).

The significance of English in Saudi Arabia is not unique; other non-English speaking countries also place a premium on the language. According to Jamel (2020) and Al-Nasser (2015), English is the vernacular of science, technology, commerce, and political or diplomatic dialogues. It is used by many people in the working world, including Saudi Arabia. Saudi Arabia has recognized the importance of English as a key skill for its development and integration into the global economic order for almost a century (Mutambik et al., 2018; Al-Nasser, 2015; Jamel, 2020). According to Mutambik et al. (2018), English is taught as a main subject in schools and is utilised as a means of instruction in colleges and institutions. One of the major modifications being made to the Saudi educational system is the addition of English to the curriculum (Mutambik et al., 2018). Teaching English is viewed as a way to speed up Saudi Arabia's integration with the global community in its schools, colleges, and institutions (Hasanzoy et al., 2019). Building political, cultural, and other ties with other countries is also thought to need it (Al-Zahrani & Rajab, 2017).

Overall, the teaching of English in Saudi Arabia's educational institutions has been a long-standing practice aimed at equipping students with the necessary skills for their integration into the global economic order (Mutambik et al., 2018). However, there are ongoing discussions and debates regarding the use of English as the medium of instruction in higher education (Al-Kahtany et al., 2015). 'Modernisers' and 'traditionalists' in Saudi Arabia's educational system hold

different positions in this debate. Since English is a global language, ‘modernisers’ say that it should be taught. They think learning English helps Saudis get into college, work, and the global economy. This group highlights the need to adapt to new times and prioritise practical skills that might boost Saudi Arabia’s worldwide competence.

However, ‘traditionalists’ defend Saudi culture and history. They claim the influence of English in school could damage Arabic language and culture. Many traditionalists think Arabic should be the primary language of study in Saudi Arabia to preserve its culture and language.

This dispute symbolises Saudi Arabia’s educational system’s conflict between globalisation and preservation of tradition. The traditionalists value Saudi Arabia’s cultural and linguistic identity, whereas modernisers value English learning for use in life.

Politicians and educators have to find the practical benefits of English language skills with Saudi heritage to end this conflict. Bilingual programmes that teach English and Arabic can do this. Both languages may be taught in Saudi schools so pupils can learn English while retaining their culture.

In light of the present prominence of English in world affairs, Saudi Arabia’s role in global commerce needs to be considered. Saudi Arabia, the biggest nation in the Middle East and one of the world’s main oil producers, has grown to be a key force in the international economy. As a result, English proficiency has grown in importance for Saudi enterprises and professions in order to facilitate international trade and commerce (Al-Nasser, 2015; Jamel, 2020).

Moreover, Saudi Arabia is the home to two of Islam’s sacred locations, Mecca and Medina, which annually draw a significant number of pilgrims, with Muslims from all over the globe traveling to Saudi Arabia to partake in the annual pilgrimage known as the Hajj (Robbins and Aydede, 2001; Hashim et al., 2021). While Arabic is the official language of Saudi Arabia, not all pilgrims speak it as their native tongue. Numerous pilgrims originate from Europe, Africa and South East Asia, where Arabic is not widely spoken (Abdelazeez and Shaout, 2016; Alzhrani and Alkubaidi, 2020). To meet the diverse linguistic requirements of these travellers, it is necessary for Saudi Arabians employed in the tourism and hospitality industries to speak English (Elamin and Tlaiss, 2015; Taibah et al., 2018). By speaking English fluently, personnel in the tourism and hospitality industries are able to effectively communicate with non-Arabic-speaking pilgrims, ensuring a seamless and pleasurable experience for visitors (Alshammari et al., 2019).

Furthermore, English proficiency among the Saudi Arabian workforce is essential for the country's wider tourism industry, which, although limited, is set to expand as part of the country's Vision 2030. As Saudi Arabia seeks to attract more tourists and diversify its economy, it is essential to provide services that accommodate the requirements of international tourists. English functions as a common language for communication in the global tourism industry, and speaking English improves a country's ability to interact with visitors from various countries.

However, in spite of these improvements, the growth of the English language in Saudi Arabia appears to have stagnated (Ur Rahman and Alhaisoni, 2013). The MoE appears to have recognised this and has devised a series of language education policies known collectively as Saudi English Language Education Policies (SELEP) for learning and teaching the English language (Faruk, 2014). These goals were provided by the MoE in a format document that claims efforts have to be made to improve English language learning at all three levels of the education system: primary, intermediate and high. Six essential goals were set out emphasising the importance of English (Alamri, 2008):

1. To improve universal communication
2. To establish a promising future career
3. To expand Muslim belief and horizons globally using the English language as the means of communication across cultures and countries
4. To communicate fluently with native speakers of English instead of depending merely on Arabic
5. To establish a cultural, social, and economic environment in Saudi Arabia open to the use of English
6. To own the ability to gain knowledge through the use of English

SELEP considers the English language as the universal language of science, commerce, technology, arts and communication, as well as possessing important economic, religious, social, cultural and political importance such that it should be especially promoted. Similarly, English, as the world's only true global language, is seen as an applicable means by which Islam's message could be extended globally.

2.1.2 Kinds of language schools in Saudi Arabia

In Saudi Arabia, there are three principal types of English language school. The first kind is private business language schools such as Wall Street, International House, the British Council, New Horizon and Direct English. These schools give various courses from short General English courses to long, specific, and international exam preparation courses such as IELTS. Female English instructors give all classes to women in these centres, and male instructors teach

male-only classes, and each school has two sessions (times of the day), one for men and one for women. The MoE supervises language schools.

The second kind of language school is the 'in-house language training' school. For example, several multinational organisations in Saudi Arabia give language education about the organisation's various needs, such as Saudi Aramco and Saudi Basic Industries Corporation (SABIC). Language classes in these schools are open to both men and women workers and are offered in a co-ed system in several circumstances. These English language schools are administered mainly by the internal systems of the individual businesses.

The final kind of English language school relates to higher education institutes, primarily located in the foundation year of universities. These schools provide undergraduates and - less so - postgraduate courses and are operated and managed by their respective universities.

2.2 English Language Teaching in Saudi Arabian Universities

The first Saudi college established to teach the English language was in Makkah Al-Mukaramah city, in 1949, where teachers taught English at least two hours a week in a four-year programme. Al-Haq and Smadi (1996) noted that many universities were established following the growth of the oil industry, such as the University of King Saud (1957), the University of King Abdul-Aziz (1961), the University of Imam Mohammad Ibn Saud in (1974), the University of King Fahd (1975), the University of King Faisal (1976) and the University of Umm Al-Qura (1980). Alghamdi (2018) has listed the universities that have been established since 1980, namely King Khalid University (1998), Qassim University (2003), Taibah University (2003), Taif University (2003), the University of King Saud bin Abdulaziz for Health Sciences (2005), Jazan University (2005), the University of Hail (2005), Al Jouf University (2005), Albaha University (2005), the University of Tabuk (2006), Najran University (2006), Northern Border University (2007), Princess Nourah bint Abdulrahman University (2008), Shaqra University (2009), Prince Sattam Bin Abdulaziz University (2009), Imam Abdulrahman Bin Faisal University (2009), Majmaah University (2009), Saudi Electronic University (2011), the University of Hafr Al Batin (2014), the University of Bisha, (2014) and, finally, the University of Jeddah (2014). The first Saudi university to establish a specific English school was King Saud University, in 1957 (Al-Haq & Smadi 1996). Several universities then opened English departments, while others opened centres of specific English language training which sought to provide English pedagogical courses and institutes of Arabic-English translation (Al-Haq & Smadi 1996).

Currently, according to the information given by Saudi Arabian universities and the MoE, a bachelor's degree should be at least four years of study and all students should take English as a mandatory subject at Saudi universities. English is taught as an essential course more than one time weekly for undergraduate students.

2.2.1 Teaching English via technology in Saudi Arabia

The beginning of the 21st century saw a huge increase in most people's use of technology. As a result, the MoE began improving electronic learning materials to encourage courses in teaching English (Alshumaimeri, 2008). The Ministry created a project called Tatweer in 2007, which encourages educators to improve curricula and enhance the pedagogical environment. It was the first pedagogical project in Saudi Arabia to develop teaching.

As noted above, a rise in the country's population and a drop in the oil price saw the country begin to focus on diversifying its economy, at the heart of which lies an overhaul of educational methods. It was recognised that it is essential to encourage learners and residents to study critically and creatively. McEvers (2009) concluded that we need to decrease educational centres focusing on Islam to achieve wider educational objectives in Saudi Arabia. Tatweer began in five main Saudi cities: Jeddah, Riyadh, Medina, Abha and Taif. The project has a heavy emphasis on the utilisation of multimedia and technology and free laptops were given to learners in four selected schools in each of the named cities. Workrooms are provided with internet-computers to teach English and other subjects. The labs provide an appropriate setting for instructors to utilise computers for teaching and learning. The project is at the heart of state attempts to change education in Saudi Arabia from classical learning to digital learning, in line with global trends (MoE, 2008).

The current research investigates the use of technology by undergraduate students for learning English vocabulary. The participants are intermediate students at the selected university in Albaha. Albaha, which has a population of approximately 533,000 (General Authority for Statistics, 2019), is popular with tourists due to its location in the Hejaz Mountains of western Saudi Arabia, where it enjoys a much cooler climate than the rest of the country. Albaha University's new English curriculum focuses on digital learning. In the next section, I pull together all of the material in the current section to consider why pushed output might be a solution.

A number of research papers have looked at the usage of email in the context of English Language Teaching (ELT). For example, Warschauer and Matuchniak (2010) discovered that email

communication between students and teachers can enhance language learning by providing personalised feedback and opportunities to practise writing in authentic situations. This personalised feedback provides students with specific guidance on their language use and areas for improvement (Kim et al., 2016). Feedback with personalised comments and suggestions can address specific language errors, offer explanations, and provide improvement recommendations (Kim et al., 2016). The personalised nature of email communication enables instructors to tailor their feedback to each student's needs, which can be more effective than generic feedback provided in the classroom (Kim et al., 2016).

Email communication can also facilitate vocabulary consolidation (Kim et al., 2016). Email exchanges require students to use vocabulary contextually and apply their knowledge to real-world situations. Using verbs in context, as is required in real-world writing situations, can improve lexical learning by assisting students in comprehending the subcategorization properties of those verbs. Understanding the subcategorization properties of a verb, according to Hare, McRae, and Elman (2003), requires knowledge of the complements and arguments that the verb can accept. Learners can gain a deeper understanding of the verb's subcategorisation properties and expand their lexical knowledge by observing how verbs are used with various types of complements when they use verbs in context.

In addition, contextual information is incorporated into the lexical representation when verbs are used in realistic writing contexts. According to Dell'Acqua et al. (2000), a word's lexical representation comprises both its meaning and the contexts in which it is typically employed. By using words and phrases in authentic communication, students can internalise the contextual information associated with those words, thereby improving their ability to use those words appropriately in future contexts.

Finally, the asynchronous nature of email allows students to deliberate over their word choices and look up unfamiliar vocabulary, which can further improve their comprehension and retention of new words (Kim et al., 2016).

Overall, then, email communication in ELT provides students with personalised feedback and opportunities to practise writing in authentic contexts, which can enhance language learning and vocabulary retention (Kim et al., 2016). By receiving individualised feedback, students can address their specific language needs and advance their language proficiency. In addition, the use of email permits students to engage in authentic communication and apply their vocabulary

knowledge in relevant contexts. This reinforces their comprehension and retention of new vocabulary and expressions. Incorporating email into ELT can therefore be a valuable tool for language development and learning.

2.2.2 Teaching English via technology with pushed output

Encouraging output appears to have a favourable impact on vocabulary retention, underlining the possible value of the pushed output approach. However, other factors, such as the overall learning environment, may also contribute to the use of technology. Furthermore, encouraging the use of a social context in an interactive environment may also support the necessary cognitive functions for developing and remembering vocabulary and the ability to self-correct, as Jafari and Chalak (2016) noted. The rationale for this is that as learners are pushed to produce output and improve and correct it, whether in a face-to-face or digital arena, there is an increased accuracy and conciseness in their overall output, and an increased number of words will be used to express ideas, opinions and descriptions (Swain, 2000; Taj et al, 2017). This suggests that using technologies gives students a means to engage in an interactive environment and affords them time to reflect on their language. Although a face-to-face context provides many of the same opportunities as a digital environment, it is anticipated that using a digital medium will produce greater benefits due to it being a less pressured learning environment (this is detailed in the next chapter).

2.3 Vocabulary Instruction

2.3.1 Academic vocabulary

Snow (2010) stated that academic vocabulary is an essential ingredient of academic style or language, a register of the English language utilised in universities and schools that is decisive for academic success. Academic vocabulary can be categorised into two main types: domain-specific vocabulary (Marzano and Pickering, 2005; Hiebert and Lubliner, 2008) and general academic vocabulary (Bailey, 2006; Hiebert and Lubliner, 2008). Marzano and Pickering (2005) defined domain-specific vocabulary by noting: “Teaching specific terms in a specific way is the strongest action a teacher can take to ensure that students have the academic background knowledge they need to understand the content they will encounter in school” (p. 1). It is a kind of academic vocabulary in the context of academic domain-specific knowledge. Moreover, domain-specific vocabulary, when applied to lexical terminology, refers to technical lexical words which are needed for expressing and grasping main notions within a field (such as ‘standard deviation’, ‘mean’, etc. in the field of statistics) (Hiebert and Lubliner, 2008). General academic vocabulary comprises general helpful lexical words which occur in the discourse of

several fields, for example ‘provide’, ‘decline’, ‘affect’, etc. (Bailey, 2006; Hiebert and Lubliner, 2008).

Bravo and Cervetti (2008) stated that knowledge of domain-specific vocabulary is essential for mastery in the sciences and other technical-related subjects. However, domain-specific vocabulary poses a challenge for learners since it tends to be unfamiliar and complex (ibid.). Similarly, general academic vocabulary poses a challenge for English students who are unfamiliar with academic writing in general and who have had little exposure to it at school. Usually, academic vocabulary is low in frequency, semantically opaque and non-concrete (Corson, 1997), making it hard to comprehend.

Although incidental learning of vocabulary during reading is a crucial way to expand vocabulary (Nagy & Anderson, 1984; Jenkins et al., 1984; Stanovich, 1986), research has proposed that an individual word’s degree of abstractness influences vocabulary learning (Schwanenflugel et al., 1997), making academic vocabulary learning more challenging than learning standard vocabulary. Furthermore, little proof of incidental learning of abstract and complex words is found from one or two incidences of exposure through ordinary reading (Nagy, et al., 1987). Since academic words are frequently abstract and complex, research has posited that incidental learning is insufficient for learners acquiring new academic vocabulary between L2 students and others with confined direction to academic talk (Carlo et al., 2004). It has been claimed that to accelerate these learners’ ability to read and write as well as expand their content knowledge, academic words should be taught by ‘pushed output’ learning activities (see below), which are believed to encourage the use of vocabulary and aid learners to discover the meaning of unknown items (Nation & Meara, 2010).

2.3.2 Vocabulary and the four skills

As mentioned above with regard to the importance of vocabulary, this section investigates which of the four skills - writing, speaking, listening and reading - are essential for building vocabulary knowledge. Oxford and Crookall (1990) claimed that listening practice in a second language cannot be the only way to build vocabulary knowledge. Recognising a new word in a second language or being able to predict the meaning of an unfamiliar word in speech does not indicate that learners have really learned the word; in general, as in reading, a strange word can be ‘skipped’, and context is relied on to give sufficient clues to the general meaning of the entire sentence (Oxford and Crookall, 1990). Even frequent exposure to the lexical item in different contexts does not guarantee that learners will recognise or understand the lexical item each time; it is not equivalent to productive knowledge (ibid.).

Several studies have proposed that, of the different language activities that include new words, writing is one of the most effective methods of practicing vocabulary to ensure that it is retained in learners' memories (Lee, 2003; Webb, 2009). One of the ways of doing this in the current research is translation. According to Laufer and Girsai (2008), translation tasks offer an efficient way to remember new words than do other form-concentrated tasks. Moreover, Kelley et al. (2010) stated that when learners use new vocabulary accurately in writing, they tend to have a firmer grasp of its definition and usage.

The superiority of cognitively demanding tasks that consist of various kinds of writing could, in theory, be demonstrated via the pushed output hypothesis (Swain, 1985) – for Swain, the movement from semantic analysis of the target language to a greater form of synthetic analysis - according to which students want to extend the linguistic resources they have to complete a given task.

2.4 The Essence of Testing Vocabulary Knowledge

Students with a more extensive vocabulary are predicted to achieve well in different language tasks. Therefore, evaluating a student's vocabulary knowledge should summarise a student's language skills. Most language programme developers note the significance of word knowledge, although they do not attempt to incorporate word evaluations in their programmes. Consequently, some language students cannot understand the significance of the naturalistic word items they experience in language programmes. The importance of word evaluations is more apparent between new language learners where lexical knowledge might identify a significant part of their language knowledge.

Eyckmans (2004) showed that lexical tests present helpful knowledge about the second language vocabulary development of students. Furthermore, these tests are a significant reference of knowledge for investigators to assist them estimate the degree of a student's knowledge of words and of how fast learners' target lexical items develop and how these parts are linked to other factors of their lexical proficiency (*ibid.*). Lexical knowledge examinations can work in a similar way to other kinds of language evaluation examinations. For instance, they could be utilised as a placement examination to designate language students to a suitable level or a performance examination to test whether they have acquired the lexical items they have learnt. Moreover, language tutors can utilise these tests to identify gaps in students' grasp of vocabulary. Students' performances in lexical item proficiency examinations (e.g. IELTS and TOEFL) can additionally be helpful indicators of their overall language knowledge (Schmitt, 2000; Eyckmans, 2004).

2.5 Summary of Chapter 2

This chapter has provided an outline of teaching English in Saudi Arabia up to the present. The education system in Saudi universities was summarised. The different social, historical and cultural aspects that contribute to teaching English in Saudi Arabia were sketched, and issues specific to the country and the culture were depicted. Different stages of how the teaching of English has developed were explained to provide an overview of the circumstances of the subject in Saudi Arabia.

The chapter also covered teaching English via technology and then introduced pushed output, linking technology with pushed output in learning English vocabulary. Vocabulary instruction was also discussed in terms of ‘academic vocabulary’ and the four skills - listening, speaking, writing and reading – and which skill(s) play(s) a significant role in learning vocabulary and retaining it in learners’ memories was explored. Finally, the basics of testing vocabulary knowledge were considered in detail. The next reviews the literature relevant underpinning the current research.

Chapter 3. Literature Review

3.0 Introduction to the Chapter

Chapter 3 considers second language vocabulary learning and how some researchers have explained what it means to ‘know’ a lexical item and how L2 vocabulary knowledge is measured. The chapter also explores the psychological theories supporting pushed output and technology-enhanced learning to help EFL learners learn vocabulary. The pushed output hypothesis is firmly embedded in language studies and teaching as a critical element in encouraging learning (Swain, 1985, 1993). Similarly, the adoption of technology in education is also becoming well recognised as a tool that should be available for students and teachers (Pirasteh, 2014; Shadiev et al., 2017).

The chapter begins with a discussion of vocabulary knowledge, including vocabulary breadth and vocabulary depth. Then, Section 3.2 discusses the mental lexicon in a second language. Section 3.3 looks at second language vocabulary learning and how some researchers have explained what it means to ‘know’ a lexical item and how L2 vocabulary knowledge is measured. Section 3.4 considers input versus output and then looks at output functions in learning second language vocabulary. Next, Section 3.5 carries out a literature review to investigate the role of pushed output in vocabulary learning, before turning to the testing effect and comprehension versus production vocabulary. Next, Section 3.6 focuses on reviewing the data on technology- and non-technology-based vocabulary learning activities regarding Saudi EFL learners’ pushed output vocabulary learning. Lastly, Section 3.7 concludes the chapter by setting out the research gap the current thesis aims to fill.

3.1 Vocabulary Knowledge

In recent years, in the domain of L2, many researchers have tried to clarify what it means to ‘know’ a lexical item. An assortment of proposals has been made to explain vocabulary knowledge (see, for instance, recent reviews in: Cronbach, 1942; Richards, 1976; Nation, 1990; Meara 1996; Vermeer, 2001).

In 1942, Cronbach was one of the first to define vocabulary knowledge by dividing it into two main classes: 1. Knowledge of word meaning, including precision of meaning, breadth of meaning and generalisation; and 2. accessibility levels to the knowledge, including application and availability. Qian (2002) stated that when concentrating on the meaning feature of a lexical item, the pioneering explanation is overlooked to accommodate other features of lexical item knowledge, for example, pronunciation, spelling, collocation and morpho-syntactic properties.

The ease by which a learner can access their word bank and actually apply that knowledge to spoken English. Willis (2003) notes this applies to the ease in which language rules are applied.

Later, Richards (1976) offered an inclusive definition of what it means to know a word. He stated that two features shape lexical competence, namely the associations and the frequency with which we come across a word and the syntax (Richards, 1976 as cited in Shen, 2008). Meara (1996) argued that Richards' assumptions are not comprehensive, and that his proposals constitute only a general framework which sheds light on the multifarious nature of knowing a word.

Combining the framework of Richards with other constituents, Nation (1990) suggested that lexical item knowledge could be split into different classes, each possessing productive and receptive aspects. There are the spoken and written forms of a word as well as its collocational and grammatical behaviour. Moreover, we need to recognise the frequency of a word and the constraints of its stylistic registry, as well as understand its conceptual meaning. In short, it is necessary to know the associations a word has with other words (cited in Schmitt & Meara, 1997). Schmitt and Meara (1997) held that if learners fully possess previous aspects of word knowledge, they can approach the fluency and competency of native speakers. In a similar way, Vermeer (2001) collected data and categorised word knowledge into different aspects and proposed that lexical items consist of a network of related nodes: conceptual, morphological, socio-linguistic, phonological and thematic. When the network deepens around the word, the knowledge of a given word becomes greater.

According to Qian (2002), there appears to be a trend to consider vocabulary knowledge as a multidimensional construct instead of a singular issue. The recognition of the complexity of vocabulary knowledge is reflected in other, complementary frameworks that suppose that at least two essential measurements shape vocabulary knowledge - depth and breadth.

The use of word formation processes by intermediate ESL learners is one of the aspects of lexical competence and development that this study investigates. These processes are those through which new words are created or derived from existing words in a given language (James, 2013). Word formation processes can affect the form, meaning, and grammatical class of words, and they can aid learners in expanding their vocabulary size and scope (Ellis, 1997). Previous research has demonstrated that word formation processes play a significant role in second language vocabulary learning, as they reflect learners' understanding of the internal structure and relationships of words (Laufer & Waldman, 2011). Word formation processes can

also aid in vocabulary learning by allowing students to infer the meaning and usage of unfamiliar words based on their morphological components and patterns (Schmitt & Zimmerman, 2002). This study analyses students' writings in terms of their use of various word forms, such as suffixes and derivations, in order to evaluate their lexical competence and growth.

3.1.1 Vocabulary breadth

Qian and Schedl (2004) stated that one frequently used term in the research literature is breadth, which relates to the number of words a person knows. This research field has produced advantageous insights related to research and education in lexical studies. For instance, knowing from 6000 to 7000 word family lexical items (words that fit into a pattern: write, re-write, re-written etc.) is required because it produces a perfect 98% text coverage while dealing with a spoken text, when knowing from 8000 to 9000 families is needed in order to deal with a written text (Nation, 2006). Nation (2006) and Hsueh-Chao and Nation (2000) stated that text coverage is defined as when a reader knows the proportion of running words within a text.

The vocabulary profile is a conceptual framework used to assess and evaluate the scope and depth of a person's vocabulary knowledge. Breadth refers to the quantity of words a person knows, while depth refers to their ability to comprehend and recognise those words (Club and Calub, 2017). Vocabulary knowledge is essential for language learners, particularly those enrolled on English for Academic Purposes (EAP) classes.

Morris and Cobb (2004) posited that vocabulary knowledge correlates with academic success. Their research explored the extent to which vocabulary profiles can lead to academic success between students of Teaching English as a Second Language. For Capel (2012, p. 1):

The Vocabulary Profile is an online vocabulary resource for teachers, teacher trainers, exam setters, materials writers and syllabus designers. It offers extensive information about the Common European Framework of Reference (CEFR) levels of words, phrases, phrasal verbs and idioms, and currently includes just under 7,000 headwords.

Morris and Cobb (2004) stated that their study found correlations between vocabulary scores of students gathered from the analysis of language of free writing exercises with scores from the academic assessments of trainees. This led the investigators to predict that vocabulary profiles could potentially predict performance in ESL programmes for undergraduate students.

Vocabulary knowledge is an essential factor for learners wanting to take more and higher courses, particularly courses in English for Academic Purposes (EAP), making the learning of vocabulary a crucial aspect of language learning. This idea is important not only for purposes of diagnostic assessment, such as identifying the language needs of learners, but as well as for placing learners in suitable courses when they undertake additional studies.

Despite the expanding recognition of the significance of a large vocabulary for academic success, discussion on this subject has been criticised for a lack of specificity. Stahl and Nagy (2006) noted in their review of the literature that the bulk of research on vocabulary learning is limited in scope, focusing primarily on the learning of discrete units of meaning rather than the understanding of how words are used in different contexts and relate to other words. There has been little discussion on classroom strategies for developing vocabulary breadth (referring to the size or extent of a person's vocabulary), a term used by researchers since at least the 1970s although there is no clear consensus on its origin and on a definition (Liu, 2018; Tran, Tremblay, and Binder, 2020). Carrell and Eisterhold (1983) noted that many studies on vocabulary instruction are based on small sample sizes and limited methodologies, and that longitudinal studies on the impact of vocabulary instruction over an extended period of time are scarce.

Recent research has provided some evidence of the benefits of a large vocabulary breadth for academic achievement, despite these limitations. Biemiller (2006) found that a large vocabulary is a strong predictor of academic achievement and is particularly essential during the early years of learning. Additionally, they found a correlation between a large vocabulary and general language proficiency and cognitive ability. Coyne et al. (2014) found that direct vocabulary instruction, such as flashcards and word lists, can enhance students' vocabulary breadth, which had a positive effect on academic achievement.

In conclusion, despite the limited discussion and review of empirical studies on vocabulary breadth, evidence supports the efficacy of various teaching strategies for enhancing students' vocabulary knowledge. Further research is required to more comprehensively explore the effect of vocabulary instruction on student outcomes and to identify the most effective strategies for enhancing classroom vocabulary breadth. Calub and Calub (2017) noted that vocabulary learning is dependent not only on the breadth of words learners know, but also on the profundity of their comprehension and recognition of words. To ensure comprehensive acquisition, it is thus necessary to consider both breadth and depth when teaching vocabulary.

3.1.2 Vocabulary depth

Nation (2001) defined vocabulary as how well vocabulary that shaped the mental lexicon of a person is recognised and acknowledged, or the quality of knowledge a person possesses of a lexical item. As highlighted in the vocabulary knowledge section about Richards' aspects, depth develops associations among words from the perspective of the lexicon. Therefore, it is considered to be the essence of knowledge depth as it is examined in this specific study. As observed from Richards' (1976) word knowledge framework, the depth of knowledge is related to how well each past aspect of vocabulary is assimilated.

More simply, measurement of the vocabulary size of a learner cannot be totally separated from several measurements of quality. This overlap was identified by Anderson and Freebody (1981), who focused on the vocabulary size of individuals, including all the lexical items a person knows, at the minimum, of the appropriate vocabulary's relevant meaning characteristics. Anderson and Freebody (1981) noted that an individual has an adequate grasp of a word if it transfers to them all of the differences that could be comprehended by a typical adult under ordinary circumstances. It may be argued that the grasping for a word varies from person to person based on the particular circumstances in which knowledge of a word is acquired. An adequately deep vocabulary knowledge varies according to what an average ESL learner would perceive as sufficient for a specific purpose. The issue to be observed is that Anderson and Freebody's (1979, 1981) definition admits that the learning of vocabulary depth is an intimately subjective and complex effort, and hence, in practice, is difficult to quantify with precision. Following on from the above discussion, L2 learning is complicated and requires theoretical exploration. The L2 Mental Lexicon, measuring vocabulary learning, output and technology, is one such theoretical proposal; therefore, its relevance to this research will be examined in the following sections.

3.2 The L2 Mental Lexicon

According to Richards and Schmidt (2002), the term 'mental lexicon' refers to the mental storage of a person using a language. It contains the associations and meanings that a person makes between specific words. The literature on the term shows that different scholars have used the notion of mental lexicon and explained it as dependent on metaphors that provide inadequate models (Aitchison, 2003; McCarthy, 1990). McCarthy (1990) provides some examples of this, such as the internet, a dictionary, an encyclopaedia, a computer, a thesaurus and a library. Schmitt and Meara (1997) stated the mental lexicon is dynamic as it allows for new information to be added and some old information to be ignored via language attrition. Aitchison (2012)

pointed out that, in fact, comparatively little is indeed recognised about the term because, as the computer metaphor proposes, it is massively complex and includes organisation and information sorting for the brain's neural structure (ibid.). Agdam and Sadeghi (2014) noted that Word Association Tests are precious tools due to their ability to produce significant insights into words in a mental lexicon. These tests have the potential to make inferences concerning the development and structure of the complex network that comprises the mental lexicon. They have the ability to measure word knowledge depth among L2 users and can take a productive or receptive format. The major hypothesis of these examinations is that proof of the knowledge of associations that learners have of words is a foundation for making inferences about the word knowledge of learners.

According to Gu and Adil (2022), learning lexical item involves learning its form, meaning, and function within a language. The function of a lexicon item refers to its grammatical properties, particularly for verbs, including its syntactic function, morphological properties, and interaction with other sentence elements. Understanding the function of a lexicon item enables effective communication and comprehension of its linguistic usage. Bybee (2010) emphasises the significance of acquiring knowledge of a lexical item's form, meaning, and function within a language for effective communication and language comprehension. This includes understanding the pronunciation, orthography, morphology, and syntax of the language. Additionally, the process of learning a lexicon item can involve other cognitive processes such as attention, perception, and memory (Peters & Webb, 2018). In terms of facilitating the learning and retention of lexical items, various teaching and learning strategies - such as direct vocabulary instruction, indirect vocabulary instruction, and mnemonic devices - have been used (Nagy & Anderson, 1984; Nagy & Scott, 2000; Peters & Webb, 2018).

In conclusion, mastering a lexical item requires linguistic, cognitive, and educational processes. It is a complex, ongoing process involving the development of knowledge of a word's form, meaning, and usage, as well as its storage and retrieval from memory.

3.3 Learning Vocabulary

The necessity of English vocabulary learning for English Language Learners can hardly be exaggerated. Learners cannot grasp what they are reading without vocabulary knowledge, even if they know how to decode perfectly. In fact, this is the case for all learners, not just ELL learners. Indeed, it has been shown that children from low income families, both bilingual and monolingual, possess a poorer vocabulary than their better off peers, and this vocabulary knowledge correlates with lower reading and writing ability (Dickinson et al., 2003). Moreover,

Proctor et al. (2005) observed the converse: a richer vocabulary knowledge correlates with better reading and listening comprehension (as cited in Ayre, et al., 2010). Furthermore, Carlo et al. (2004) stated that interventions intended to directly teach English vocabulary improved both reading comprehension and vocabulary for ELL learners.

Learning vocabulary can contribute to the understanding thereof. Nation and Waring (2013) claimed that readers who know 95% of the vocabulary of a given text can rightly guess the meaning of other words in the text. Vocabulary learning from English reading is based on the type of interaction and initial vocabulary skills received from adult people who read to them (Reese & Cox, 1999). Children who begin with a large vocabulary are able to understand more from reading rather than children who possess a small initial vocabulary. For the reason that vocabulary has such far-reaching effects on English learners' success, every endeavour must be made to boost vocabulary learning so that English learners can earn and utilise a larger vocabulary as quickly and efficiently as possible (Sénéchal et al., 1995). Learners need to know about 3,000 English words in order to achieve an understandable level of spoken conversation without supplemental instruction (Nation & Waring, 2013).

Acquiring English vocabulary in L2 is different from acquiring vocabulary in L1. Appel (1996) identified three differences in vocabulary learning. Firstly, there is the cognitive improvement stage of the student. Students of the first language can only study vocabulary if they arrive at a particular stage in cognitive improvement. On the contrary, second language learners' vocabulary knowledge can further motivate cognitive development. First language learners have learned to analyse and classify the world around them as a development of their cognitive evolution, and the lexical items they learn are titles for the classifications outstanding. On the other hand, second language learners are different due to relatively development in the learner's cognitive evolution stage, which depends on the age second language learning begins. Therefore, particularly in the case of adult second language students, the second language lexicon is not a situation to the globe and appropriate concepts or classifications as the first language lexicon is. Secondly, second language learners have a semantic system for their mother tongue, in contrast to first language learners, who must create an entire semantic system when learning vocabulary. The first language semantic system reveals connections and variations with the semantic system of the second language. Connections between the two systems promote learning of second language vocabulary. However, as Appel (1996) declared, the variations make acquiring new vocabulary complex because the equivalent of most second language vocabulary differs to its first language equivalent. Thirdly, children naturally learn vocabulary, while effort

is required to create a lexicon in the second language. Moreover, Appel (1996) stated that second language students experience the problem of incidentally acquiring vocabulary compared to first language learners, particularly if there are no native speakers in the environment surrounding them. Appel (1996) added that the elaboration of vocabulary in the acquisition process progresses into two ways: 1) students acquire new vocabulary; and 2) they acquire particular meanings, in turn expanding the meaning of each word.

The concepts of vocabulary acquisition and vocabulary learning are closely related but have distinct connotations (Asyiah, 2017). While acquisition and learning are distinct processes, they frequently occur concurrently. Vocabulary acquisition is an implicit process that predominantly takes place through language exposure, whereas vocabulary learning is an explicit process that takes place through instruction and practise (Mahmood et al., 2020). Vocabulary acquisition is frequently deemed incidental, indicating that it occurs as a byproduct of other activities that are not explicitly geared towards vocabulary acquisition. On the other hand, vocabulary learning requires explicit instruction and practise in which learners actively engage with the words they are using (Mahmood et al., 2020). Mahmood et al. (2020) found that second language learners can acquire vocabulary incidentally through a variety of activities that are not specifically designed for vocabulary acquisition.

Importantly, incidental vocabulary acquisition is typically limited to the first few thousand most frequent words, and explicit instruction and practise are required for the acquisition of less frequent and specialised vocabulary (Mahmood et al., 2020). Incidental learning, as noted, is when learning vocabulary is a by product of any activity that is not specifically designed for vocabulary acquisition. This means that vocabulary acquisition can occur through exposure to language in various contexts, such as reading, listening, and conversing (Rahul & Ponniah, 2020). However, explicit vocabulary acquisition, which entails deliberate instruction and practise, is also essential for developing a rich and diverse vocabulary (Bryant et al., 2003).

Effective instructional practises for teaching vocabulary include providing multiple practise opportunities, developing in-depth word-meaning knowledge, and engaging students in meaningful ways that require the application of word meanings across a variety of situations (Bryant et al., 2003). Research has also emphasised the significance of linking new words to previously learned words, providing numerous repetitions to aid retention, and engaging learners in non-anxiety-provoking communication activities (Ruth, 2021). Additionally, technology can contribute to vocabulary development. For instance, Padlet, a digital instrument, can be utilised as a medium for participants to actively participate in their vocabulary acquisition (Hamid et al.,

2019). The incorporation of technology into vocabulary instruction can provide interactive and engaging learning opportunities, which can improve vocabulary acquisition (Hamid et al., 2019).

Both vocabulary acquisition and vocabulary learning are crucial for language development. The acquisition of vocabulary occurs implicitly through language exposure, whereas vocabulary learning requires explicit instruction and practise. It is possible to acquire vocabulary incidentally through participation in a variety of activities, but explicit vocabulary instruction is required for the acquisition of uncommon and specialised terms. Vocabulary acquisition and learning can be enhanced through the use of effective instructional practises and technology.

The focus of this study is vocabulary learning via "pushed output activities," as described by Schmitt (2000), who classified vocabulary instruction into three categories: incidental learning through language input, explicit instruction of vocabulary items, and learning vocabulary through output. The section that follows will elaborate on assessing L2 vocabulary and vocabulary instruction.

3.3.1 Measuring L2 vocabulary

A range of tests can be undertaken to measure vocabulary, including the vocabulary levels test (VLT), which focuses only on receptive language. Developed by Goulden et al (1990) and revised by Schmitt et al (2001), the VLT assesses the knowledge required for reading using four levels of frequency of use. The test format asks learners to recognise the form of the word and not the meaning, i.e. use of words rather than their definitions (Schmitt, 2010). Measuring form-meaning is useful for learners to develop much of the advanced kinds of knowledge of a word for any item in the lexicon. Indeed, this is also the case for native speakers and high level learners. Whilst effective for receptive language vocabulary, the VLT does not evaluate productive vocabulary knowledge, which is key for foreign language competence. Other approaches to vocabulary assessment include multiple choice, or filling in blanks or matching tasks, which are at best low level evaluations of potential vocabulary knowledge. The potential does exist however for assessing vocabulary through pushed output (Kremmel & Schmitt, 2016).

Another way of measuring vocabulary knowledge is the translation/synonym approach, whereby a word is given to learners, who then need to find either a synonym or a translation (Kostadinovska-Stojchevska, 2018). It is noted in this study that proper usage and practice of these types of words are noted to be one of the key characteristics and markers of command of foreign language speaking. The rationale for adopting this approach is that, as Joyce (2018)

noted, looking for a translation encourages the activation of cognitive processes that require searching for the right word to convey the accurate meaning in the target language (see Table 1). This means that the student may consider alternatives before deciding on which word to use in their message. This process – of deciding - could suggest that the student has a wider vocabulary than indicated by the final word choice (González-Fernández, & Schmitt, 2017; Zhang et al, 2017). The inclusion of a synonym task indicates that an understanding of the word and how it should be used in output exists, as Joyce (2018) further noted.

Yet another approach to measuring vocabulary knowledge is familiarity scales, which assess a learner's subjective impression of their familiarity with a word. Wesche and Paribakht (1996) developed this approach and devised a scale containing five stages of vocabulary knowledge. They proposed a group of short tests which are able to identify where any specific word is placed on the scale. The five scales are identified as statements that students can make about their lexical knowledge of a specific word. With more complex statements, some proof that the student's claim is true is demanded (Wesche and Paribakht, 1996). Wesche and Paribakht's (1996) scales are:

1. I do not remember having seen this word before
2. I have seen this word before but I don't know what it means
3. I have seen this word before and I think it means...
4. I know this word. It means...
5. I can use this word in a sentence e.g....

The scales include five states, each clearly illustrate no knowledge at all about a specific word. This illustrates that the efficient scale is just four points (Wesche & Paribakht, 1996). Wesche and Paribakht (1996) stated that the Vocabulary Knowledge Scale (VKS) is a four-point scale which allows learners to indicate their level of knowledge of vocabulary (Wesche and Paribakht, 1996). As a self-report scale it is useful for measuring small increases in knowledge. The scale uses the notion of vocabulary depth and recognises that there may be multiple aspects of word knowledge, which in turn means that acquiring vocabulary means a gradual and incremental growth of lexical items.

Another approach to measuring vocabulary is to test productive knowledge by making use of Laufer and Nation's 1999 production test. This test is focused on controlled production as a measure of productive vocabulary through the administration of five frequency levels and the adoption of completion items such as "*the garden was full of fra_____flowers*". The student then completes the phrases based on their productive ability.

The given number of letters for each word allows the learner to eliminate possible alternatives to the tested lexical item. The exam utilises the initial half of a lexical item with the smaller number of letters being supplied if the word/lexical item has an odd number of letters (e.g., the initial two letters are supplied if the word consists of five letters). Because this task involves testing productive vocabulary knowledge, it is more appropriate to supply the minimum number of letters in order to remove uncertainty from the cue. If two letters might refer to two potential words in the target sentence, an additional character is added to allow elimination of this possibility. The underlined space's size, at the end of each lexical item that is not finished, is no clarification of the number of letters required to finish it.

Another approach to measure vocabulary knowledge is informal assessment (see Table 1). Informal assessment is the common phenomenon of learning through knowledge creation or learning through participation, in contrast with the classical notion of knowledge acquisition through teacher-centred learning (Paradise & Rogoff, 2009). Informal learning is not structured and does not have set objectives; rather, it occurs unintentionally as the learner becomes absorbed in an activity or situation such as, for example, using English over digital forums and learning new vocabulary and phrases (Wong, 2012). The benefits of informal learning entail less pressure due to the fact that there are generally no clearly defined objectives. In addition, when the learning occurs in conjunction with technology, for example with a message application or similar equipment, there is an increased curiosity and engagement from the learner due, as Gholami et al. (2012) noted, to the social context of the process.

However, measuring vocabulary knowledge is key to evaluating the effectiveness of any activities, as the ways to measure vocabulary knowledge explained above may also be identified as lexical richness, i.e. the use of a wide and varied vocabulary (see Table 1).

Table 1: Testing Vocabulary

Approach	Description	Benefits	Disadvantages
Vocabulary Knowledge Scales	Learners indicate on a scale their familiarity with and knowledge of identified words	Can highlight learners views of their knowledge and indicate vocabulary size	Is self-reported knowledge and thus subject to potential bias
Vocabulary Levels Test	Assesses receptive vocabulary through identification of words against a range of meanings	Gives good base level indication of knowledge	Only assesses receptive vocabulary

The test of productive knowledge	Assesses productive vocabulary through the adoption of completion items	Gives good base level indication of knowledge	Only assesses productive vocabulary
Informal Assessment (i.e. not part of a formal test with grading outcomes)	Multiple choice/fill in blanks or similar test	Students can demonstrate knowledge	Very shallow measure of knowledge
Translation/Synonyms	Students translate words from L1 to L2 (or vice versa) and identify synonyms	Identifies the cognitive processes necessary for effective output and knowledge of words in target language	Can be context dependent and challenging if no direct translation exists

Alongside understanding vocabulary, there is also a need to understand and identify which activities and technologies are the most viable way to do this. Before considering this, however, a more detailed view of technologies and ‘pushed output’ (which is fully addressed in the following chapter) and its role in vocabulary learning is considered.

3.4 Input vs. Output

Within the area of L2 vocabulary learning, there are roles for both output and input with second language learning research and pedagogy, which has been extensively covered in recent decades (Byrne and Jones, 2014). The research body has yielded essential insights into L2 vocabulary learning. Previous research on vocabulary learning has argued that pedagogical methods which focus on output has seen benefits from acquiring receptive vocabulary. These studies concentrate on the significance of related input in facilitating the vocabulary knowledge of L2 learners instead of the significance of output. However, some studies posit that output is just as important as input for acquiring higher productive and receptive vocabulary knowledge (Ellis and He, 1999). The output hypothesis is the main theoretical argument of previous studies (Swain, 1985), as it sees productive language as the trigger to meanings and forms of language.

Swain (1985, 1995) stated that learners acquire and learn a second language when they have to produce their answers in output which consists of linguistic forms in the interlanguage system. Swain (1995) argued that “producing output is one way of testing a hypothesis about comprehensibility or linguistic well-formedness” (p. 126). Consequently, producing language forces learners to process meanings and forms of language in more depth than if they are merely exposed to input. Hence, according to Swain, input is necessary but not sufficient for developing second language proficiency. Stressing the significance of output as well as input for promoting

of acquiring language, Swain (1985, 1995) argued that the output hypothesis is not merely the outcome of acquiring the second language, but also one of the contributing factors in learning.

Recent studies on fruitful lexical proficiency are largely the result of increased interest in the function of output in learning L2. According to the data, the productive vocabulary knowledge of second language learners does not progress at the same rate as their receptive vocabulary knowledge. When receptive vocabulary knowledge increases, only a small portion is productive without instruction on productive vocabulary (Laufer, 1995; Lee, 2003). Lee (2003) investigated the effects of various instructional methods on developing the utilisation of productive vocabulary in the writing of secondary school English second language students in Canada. He discovered that vocabulary education, utilising different learning procedures consisting of writing, reading and understanding target language and target lexical item learning in structured exercises, improved the productivity of the target lexical item. He suggested that systematic lexical item instruction can assist in converting receptive vocabulary into productive vocabulary.

There is additional evidence to suggest that productive vocabulary acquisition requires different learning conditions than receptive vocabulary acquisition (Ellis & He, 1999; Hulstijn & Laufer, 2001; de la Fuente, 2002). According to these studies, output is a crucial factor in fostering the acquisition of productive vocabulary. In other words, these studies refuted Krashen's (1985) assertion that producing vocabulary is a natural process followed by the acquisition of receptive vocabulary. This suggests that input alone is insufficient to promote receptive and productive vocabulary development; output is just as important as input as a condition for vocabulary acquisition.

The preceding studies' findings led to two essential conclusions. Firstly, receptive to productive vocabulary improvement does not appear inherently in second language acquisition and, consequently, various instructional conditions (such as input, output and pushed output) are required to convert receptive knowledge into productive knowledge vocabulary. Faraj (2015) noted that in order to have effective pedagogy in this matter, the ESL teacher needs to present the detailed components of not only an individual word, but the connected words that are often used alongside it. Secondly, sufficient instructions for productive vocabulary acquisition essentially include a condition of output task. These conclusions invite a number of vital questions: What particular functions or areas of output can affect the development of second language vocabulary? What learning situations are optimal for maximising these areas of output?

To address the initial problem, there are disputes about whether output can positively affect vocabulary acquisition of second language learners concerning three functions. The first function of output is a hypothesis-testing function. Output production is one method of examining the hypothesis about the target language that someone is learning or translating something into. Students semantically modify their (hypothetical) output to answer feedback obtained during meaningful interaction and negotiate meaning with their instructor or peers, thereby driving accuracy in speech. The second function of output is a metalinguistic one. Swain (1995, as cited in Izumi & Bigelow, 2000) claimed that when students reflect on their target language usage, their output utilises a metalinguistic function, allowing them to internalise and control learning linguistically. More simply, output processes allow students to discover their hypotheses using their peers and the teacher. Reflection on language may extend deeply into the learners' awareness of form-function relationships, rules and even forms. The third function of output is noticing. Swain (1995, as cited in Izumi & Bigelow, 2000) stated that when learners produce the target language, they may observe a disparity between what people would like to speak and what they are able to speak, leading them to recognise what people know, partially know, or need to know. The recognition of problems of understanding may then prompt the students to attend to the related information in the input, which would trigger their interlanguage development. Their development in this regard can be addressed through test-enhanced, formative assessments.

The role of pushed output, as stated earlier, is to encourage effective language production (Nation and Newton, 2009). Output refers to the spoken or written language produced by learners as a consequence of their language learning process (Swain, 1985). It can be spontaneous, that is, produced without prior planning, or it can be planned, that is, produced with a specific objective in mind (Swain, 1995).

In contrast, driven output refers to language produced under particular constraints, such as those imposed by a task or prompt (Swain, 1985). These constraints direct learners to use the language in a particular way, requiring them to surpass their present proficiency level (Swain, 1995). Often, pushed output involves the use of unfamiliar vocabulary or grammar in order to expose learners to new linguistic forms and facilitate more efficient learning (Swain, 1985).

Language production is significantly influenced by discourse constraints. They include numerous contextual factors, such as the purpose of communication, the participants involved, and the social norms that regulate the interaction (Gumperz, 1982). However, the constraints for

transmitted output are more task-oriented and specific. Typically, a teacher provides learners with a prompt or task that establishes the discourse constraints for their language production.

Two scenarios can allow us to demonstrate what comprises pushed output:

In a language classroom, the instructor assigns a writing assignment requiring students to compose an argumentative essay on a given topic. The prompt specifies the use of persuasive language techniques and requires the incorporation of topic-specific terminology (Izumi, 2002). Students are challenged to produce language that persuades the reader and demonstrates their understanding of the topic by adhering to these constraints (Izumi, 2002; Tao & Yan, 2019).

According to Bardel and Falk (2007), participants in a language exchange programme engage in a role-playing activity. One participant plays the character of a tourist requesting guidance, while the other undertakes the role of a local inhabitant delivering directions. The task requires the participants to use language appropriate for a tourist-local interaction, including inquiring for directions, giving directions, and using location- and landmark-specific vocabulary. This driven output provides participants with the opportunity to practise and acquire language skills in a realistic and contextually pertinent setting.

These examples illustrate how pushed output functions within the context of particular tasks or directives, guiding students to use language in a targeted manner. pushed output facilitates language development and learning by encouraging learners to exceed their current proficiency level and exposing them to new linguistic forms.

In conclusion, output is the spontaneous or deliberate language produced by language students. The goal of pushed output is to push language learners beyond their present level of proficiency. The driven output activities are designed by the instructor, who creates challenging exercises or assignments that require the students to employ their language abilities in increasingly difficult contexts. The purpose of these activities is to encourage language learners to test their linguistic limits and communicate effectively in the target language. In the following section, the function of output in acquiring second language vocabulary will be elaborated upon.

3.4.1 Functions of output in learning Second Language vocabulary

We can begin with the first role of output in learning L2 vocabulary, which is ‘noticing’. Inquiry into how output allows second language students to gain lexical items more efficiently than input or different conditions do can be explained with the theory of ‘attention’, or ‘noticing’. Noticing originates from the mental lexicon, and the requirement that learning cannot appear

without awareness has become a central plank of current second language learning research. Various studies have examined how attention can assist the second language learning process, suggesting that it is vital for second language students to investigate and combine linguistic meanings and forms in their second language linguistic system. One of the commonly recognised recommendations demonstrating the function of attention in learning a second language is the noticing hypothesis proposed by Schmidt (2001). Schmidt hypothesised that understanding attention is essential to change the input to intake, then identified and moved to the interior processor for additional investigation. VanPatten and Oikarinen (1996) stated that the notion of intake, or 'comprehended input', is integrated with the model of Input Processing. However, only interior and known input can be combined in the interlanguage system of students.

Nevertheless, the theoretical principles of Input Processing and the noticing hypothesis were initially limited to linkages between attention and input to integrate new characteristics in the linguistic system of the second language. The interchange of attention's interaction with output was rejected in advance of the output hypothesis of Swain (1998), who illustrated various kinds of noticing hypotheses, depending on what is being referred to:

1) Attention to a pattern in the input

This variant is when students attend to the formal patterns and aspects of the target language in the input.

2) Attention to one's interlanguage insufficiencies

Students recognise their interlanguage insufficiencies while they find that they cannot accurately say what is required in the target language. Also, that variant of noticing is known as noticing 'gaps' or 'holes' (Swain, 1998).

3) Attention to the gap between the target language and interlanguage

This variant refers to students notice that their present interlanguage varies from the target language. Comments given through intercommunication can assist students to observe this type of gap between the interlanguage and the target language.

Concerning output, types two and three of noticing are similar, particularly for productive vocabulary. Type two, that is to notice the gap, is closely associated with second language students' reporting of deficiencies in producing adequate lexical items while engaging in writing or speaking despite their immediate successes in comprehension (Leki & Carson, 1997). Henriksen (1999) stated that these difficulties could be caused by second language students not knowing what to say to show their expected meaning or having a problem activating lexical

items they already know. Thus, students are limited to noticing their loss of target lexical items until they are obliged to create them. Therefore, output is crucial for bringing students' attention to target lexical items and decreasing the knowledge gap between the productive and receptive lexical items.

The inquiry into how noticing is linked with the output hypothesis in acquiring second language vocabulary is rarely demonstrated in the literature reviewed here, notwithstanding the proof that students' noticing during production appears frequently in the lexical domain. For instance, Erlam (2003) discovered that lexical items were the most significant aspect for describing students' noticing through production. She examined the relative impacts of input- and output-based instructional methods in acquiring French object pronouns in high school students studying French as a second language. The results illustrated that the output groups had more significant comprehension measures (listening and reading) and production (writing and speaking). Furthermore, Gass and Torres (2005) stated that examining interaction effects in acquiring the second language illustrated that students are helped more by a lexical production exercise during interaction. Moreover, Izumi and Bigelow (2000), as well as Van den Branden (1997), produced comparable results, but their research did not emphasise that students' noticing happened most commonly in the lexical domain. Overall, these investigations confirm that noticing can help second language students understand their absence of lexical items or seek productive vocabulary improvement.

Now we can address the second role of output in acquiring L2 vocabulary, namely, 'retrieval'. One of the numerous encouraging references of proof of the role of output concerning vocabulary knowledge is the basis of the body of knowledge examining vocabulary retrieval. For instance, De Bot (1996) assessed output's function at the lexical level. Depending on the production model proposed by Levelt (1989), the central role of output is to improve vocabulary fluency, improving the readiness of vocabulary retrieval. De Bot's central thought carries the claim is that vocabulary retrieval is two processes, and that the link between the two processes is increased by output for numerous causes.

Firstly, De Bot (1996) showed that the two forms - lemmas and lexemes - are not stimulated together: lemmas need to be stimulated first as tip-of-tongue-effect, followed by lexemes. Thus, second language students first reach lemmas, which include syntactic and semantic information about vocabulary, and later decide upon retrieving morphological and phonological information for the chosen lemma.

Secondly, De Bot (1996) stated the strength of association among lexemes and lemmas defines how fast the change from declarative to practical lexical item knowledge occurs. Moreover, the association among lexemes and lemmas could strengthen more efficiently through individual production instead of input from external references. Production provides the student with a more significant opportunity to take notice of any failure to correspond between lexemes and lemmas than input because production needs a more prominent degree of concentrated noticing to organise the articulatory-level and semantic processing (De Bot, 1996). Despite this, De Bot did not deny the functions of other factors such as the degree of linguistic variation between first and second languages and the quality and quantity of input in improving practical knowledge of the second language's vocabulary. Although output does not play a significant role in acquiring entirely new declarative knowledge, De Bot's data suggested that it is essential for converting declarative into practical second language vocabulary knowledge.

Other studies have confirmed the effects of pushed output in both the short and long term (Shintani, 2011; Birjandi & Mamaghani, 2014; Namaziandost, Dehkordi & Shafiee, 2019). Shintani (2011) supported pushed output in general when he compared the effects of output versus input. He focused on acquiring English vocabulary for EFL learners, namely 36 Japanese children, and found proof that both input and output lead to productive and receptive vocabulary knowledge compared to a control group in both post-tests and delayed post-tests. Moreover, Birjandi and Mamaghani (2014) confirmed in pre- and post-testing the facilitative influences of delayed as well as immediate written pushed output in acquiring verb tenses in English compared to the control group. Namaziandost, Dehkordi and Shafiee's (2019) comparison of the effects of input and output activities on acquiring vocabulary with Iranian L2 learners showed that groups of input and output exceeded the control group in the two periods, period one was pre-test to a post-test and period two was from pre-test to delayed post-test. In contrast to Namaziandost, Dehkordi and Shafiee (2019), empirical research by Azizi (2016) examined the comparative impacts of three groups - input of non-negotiation, input of negotiation without output and input of negotiation with pushed output - on productivity and comprehension of L2 students and 43 intermediate adult learners. A written and an oral test were conducted after the treatment, and the results showed that negotiation positively impacted the production and comprehension of targeted L2 lexical items. Input negotiation with pushed output did not improve second language vocabulary production more than input negotiation without output.

Another study focused on the association between lemmas and lexemes in learning L2 vocabulary is Wesche, Paribakht and Ready's (1994) research, which gathered data from adults from different backgrounds who were learning ESL. The learners were required to read an English

paragraph and then summarise it. Moreover, they were required to reflect on the lexical difficulties they had experienced in the paragraph. For example, - where learners had difficulties with learning the correct lexical item meaning, they would seek to practice existing examples. The idea here is that associations among the second language lexemes and lemmas are minimally stable, and lexical knowledge in the second language lexicon is less accessible for students.

Snellings, Van Gelderen and De Gloop (2002) examined whether classroom instruction can develop lexical retrieval in Dutch secondary school ESL learners. Each procedure utilised a various set of incentive words - either item set 1 or 2. For example, learners of A lexical items condition used item set 1 and learners of B lexical items condition use item set 2. Item set 3 consisted of control words. Four weeks after the intervention, the students presented improved speed (i.e., quicker response times in vocabulary decision tasks and utilisation of a more significant number of the target lexical items in the interpretation task) in vocabulary retrieval in the post-test stage. Moreover, they showed that such improved lexical retrieval was assigned to writing ability as the learners utilised the trained lexical items more frequently and more effectively used in their written texts.

Overall, the evidence gathered from past research encourages the claim that output can help as an effective means of strengthening associations between lexemes and lemmas. Such strengthened associations allow students to easily access an adequate power of lexical item knowledge collected in their second language system and raise vocabulary fluency (retrieval). When second language students are involved in output production, they must independently solve vocabulary form problems. Within such effective processing of vocabulary information, students are able to produce faster, more intuitive vocabulary instead of merely listening to or reading second language vocabulary.

We can now move now to the third role of output in acquiring L2 vocabulary, namely retention, which, in terms of how it is important for second language vocabulary, is of significant interest to investigators. There is a consensus within cognitive psychology that retaining new knowledge is based on the quality and quantity of attention people pay to different features of lexical items (Hustljin and Laufer, 2001; Kwon, 2007; Cowan, 2014). Therefore, having more qualitative and quantitative connections with current knowledge raises the possibility of retaining new information. The 'elaboration' process is crucial for describing how output production enables students to maintain lexical knowledge.

The output produces more of the development procedure from students than input induces because of the linguistic complexity in terms of processing (i.e. syntactic, phonological and semantic processing) included in producing output. Furthermore, the elaboration process drives higher levels of vocabulary retention, which was noted in experimental research by Hulstijn & Laufer (2001). These scholars gathered data from students learning EFL in Israel and Holland to investigate the impacts of three tasks on vocabulary retention. The tasks were:

- reading knowledge with marginal notes
- filling in the blanks
- a production task utilising the target lexical items

The post-test findings revealed that retention and recognition of 10 non-familiar target lexical items were most elevated for task 3 (the production task), lower in task 2 (the blank-filing task) and lowest in task 1 (the reading task). In other words, task 3 was the highest, task 2 was lower than task 3, and task 1 was lower than tasks 2 and 3. Because of these results, Hulstijn and Laufer (2001) disputed that the excellent performance in the production task could support output and presented that the composition task needed the students in developing their linguistic resources. Moreover, many researchers have claimed that output undoubtedly influences second language vocabulary retention (Hulstijn & Trompeter, 1998; Ellis & He, 1999). For example, Joe (1995), Ellis and He (1999) and Hulstijn and Trompeter (1998) have shown that lexical items utilised in composition tasks were better remembered than lexical items practiced in non-production tasks. While demonstrating the advantage of output tasks for recalling lexical items, the scholars proposed that output demands deeper processing of new lexical items than other task types.

Despite the early studies confirming the role of output in vocabulary recall, several studies have investigated the influence of output on it (see the following sections for details of these studies). These studies found no evidence that output improves long-term recall of particular linguistic characteristics better than input does in acquiring English as a second language for adults (Horibe, 2003; Sakai, 2004). Even though those studies did not concentrate on learning vocabulary, the impact of output on second language recall requires further validation. Previous studies on pushed output and vocabulary will be considered in the next section.

3.5 A Literature Search of Pushed Output and Technology in Learning Vocabulary

According to Swain's theory of pushed output, language learners must be motivated to generate appropriate, accurate, and complex language in order to improve their language skills

(McDonough, 2005). The contextualising and transforming phases of language learning are predicated on the belief that pushed output is advantageous for language learning (Swain, 1995; Setyaningsih et al., 2021). Swain also observed that students in immersion programmes have limited opportunities to negotiate meaning in the classroom, highlighting the significance of output outside the classroom as a significant learning incentive. The phenomenon of knowledge deficits, which can be completed through the learning process, lends further support to the notion that pushed output is beneficial (Alfarwan, 2022). Overall, Swain's output hypothesis (Wright, 2016) suggests that pushed output facilitates fluency, gap detection, and hypothesis testing while also controlling and internalising linguistic knowledge.

The benefits of pushed output for L2 learning have been confirmed by research. Shintani (2011) discovered, for instance, that both input and output activities enhanced productive and receptive vocabulary knowledge for ESL learners. Birjandi and Mamaghani (2014) found that both immediate and delayed written pushed output enhanced the acquisition of English verb tenses compared to a control group. Some studies, such as Azizi (2016), have found that input negotiation with pushed output is inferior to input negotiation without output.

Despite contradictory findings, there is widespread agreement that pushed output can be advantageous for L2 acquisition, particularly in terms of accuracy and vocabulary learning. To thoroughly comprehend the effects of pushed output and its optimal application in supporting L2 learning, additional research is required.

Only a small number of studies examining the effects of pushed output on vocabulary learning have been found to be relevant. In terms of productive vocabulary, De la Fuente (2002) discovered that those who produced output outperformed those who produced input among 32 intermediate English-speaking Spanish L2 learners. Shintani (2011) compared the effects of input and output on 36 Japanese EFL learners and discovered that both had positive effects on vocabulary acquisition. Hazrat and Hessamy (2013) supported the role of pushed output, finding that oral pushed output was more effective than written pushed output at promoting listening comprehension and active vocabulary learning. Beniss and Bazzaz (2014) discovered that pushed output instruction enhanced accuracy but had little effect on fluency.

In the following paragraphs, a thorough examination of these studies' methodologies will be provided. The participants in De la Fuente's (2002) study were 32 L2 intermediate learners whose native language was English and who were studying Spanish at Georgetown University. On fruitful vocabulary examinations, he discovered that students who were asked to produce

output outperformed those who were only asked to produce input. In the primary language programme, they were categorised into three distinct groups, and the learners received approximately 90 hours of formal instruction in the second language. These students were randomly assigned to one of three classes: negotiated input with output, negotiated input without output, or non-negotiated input. The students completed the primary investigation phase, but only 28 completed all three post-tests.

Another study, by Shintani (2011), compared the effects of output versus input. The study was on acquiring English vocabulary for 36 Japanese young EFL learners separated into three groups. The first group was an input group, where the learners were not required to create output; the second group was a production activity where the learners were required to create output; the third group was a control group. The study lasted six weeks and included a pre-test, a post-test and a delayed post-test. The conclusions presented additional proof that both input and output lead to productive and receptive vocabulary knowledge. Overall, the results presented comparable levels of effect for output and input in acquiring vocabulary. Nevertheless, an investigation of process characteristics revealed that input presented more chances for interaction with other students compared to the output exercises. This could demonstrate a larger achievement of the input group on the activity-based comprehension test and a likewise accomplishment in the productive examinations, notwithstanding approximately fewer second language production opportunities.

A study by Hazrat and Hessamy (2013) supported the role of pushed output. The scholars considered past investigations of the effect of preparing lexical items before comprehension of listening. The study examined the effects of the pushed output of oral and written in terms of two kinds of preparing lexical items on the comprehension of listening, namely: the strategy of using vocabulary learning as well as passive and active vocabulary learning. The participants were 41 intermediate level Iranian women L2 learners. They received two lists of new lexical items as a treatment, which were to be studied independently through written and oral pushed output, followed by passive and active vocabulary and listening comprehension tests. The participants also completed a questionnaire on studying vocabulary before the treatment and after it to determine whether there were any changes in views. The results showed that studying vocabulary during oral pushed output effectively promoted listening knowledge and active lexical item learning compared to studying lexical items with written pushed output. Commonly, studying lexical items with pushed output had a significant positive impact on the learning of lexical items. Nevertheless, the two kinds of treatment did not produce a significant variation concerning passive lexical items learning.

Beniss and Bazzaz's (2014) quantitative study explored the effects of pushed output on accuracy and fluency speaking. Thirty female L2 students were chosen who were taking an IELTS speaking exam and put randomly into experimental and control groups. The experimental group took pushed output instruction and the control group took non-pushed output treatment. The gathered data was taken from the IELTS speaking exam and each student's interview was independently tape-recorded and transcribed and coded in terms of measurement of accuracy and fluency. The outcomes showed that the pushed output instruction group bettered the non-pushed output treatment group in accuracy. However, the two groups of the study did not have a significant difference in terms of fluency. Pushed output's positive influence noted in this research is compatible with its hypothesised function. The conclusions offer valuable insights into the pro-programme scheme and the teaching of English.

Another study, by Namaziandost, Nasri and Ahmadi (2019), examined the influence of pushed output on the reading comprehension of Iranian L2 Learners. To fulfil the research goal, 50 male pre-intermediate learners were selected randomly and separated into two groups – a control group and an empirical group. The control group did not face any intervention while the empirical group used a pushed output activity. After the treatment was completed, a post-test was conducted and the results revealed that the experimental group had done much better than the control group. This outcome demonstrates that instruction based on the pushed output hypothesis improved learners' reading comprehension.

Mahmoudabadi et al. (2015) investigated the impact of pushed output on vocabulary activities. The participants were 103 female Iranian L2 students from three private English schools in Yazd, randomly split into three groups: an output-input group, an input-output group, and an input-only group. A placement test and a pre-test were taken by the participants. The students in the input did only input activities and the other two groups did input and output activities together, but in different orders. All learners did a vocabulary post-test after they had finished their treatment. The conclusions showed that output either before or after had a significant on the learners in the two pushed output groups compared with those in the input group. The positive impact meant the learners in the pushed output groups were able to close existing lexicon knowledge gaps compared with learners in the input group.

Al-Ghazo and Taamneh (2017) examined the effects of the pushed output hypothesis on developing language students' reading in Jordan. The study sample included two English reading comprehension courses, dividing 60 language and literature students into two groups of 30. The

investigators created a multiple-choice quiz to evaluate the comprehension of the learners' reading. The learners received a lexical items test and a reading accomplishment comprehension exam. The experimental group experienced an activity based pushed output, which the control group did not. When the results of the two groups were compared, the outcome showed that the empirical group's results were stronger than the control group in terms of the post-test. These outcomes confirmed that teaching based on the pushed output hypothesis successfully developed the learners' reading comprehension and their performance.

Namaziandost, Dehkordi and Shafiee's (2019) study compared the impacts of output and input activities on acquiring vocabulary of 54 Iranian second language learners at a private language school. The learners were separated into three groups, output-based, input-based and control groups. Each group did a productive vocabulary pre-test. Next, the output-based and input-based groups received the treatment, comprising nine sessions, each of fifty minutes. A productive vocabulary post-test was conducted on the three groups after the treatment was finished. Moreover, a delayed post-test was conducted two weeks later to investigate the impact of various input and output-based exercises on the vocabulary retention of L2 students. The outcomes presented that the input and output groups fared better than the control group in the two tests - post and delayed post. Nevertheless, the input and output groups did not differ in terms of their performance in acquiring vocabulary.

The results of Azizi's (2016) study of the comprehension of L2 students contrasted with those of Namaziandost, Dehkordi and Shafiee's (2019). Azizi (2016) conducted a study of comprehension of L2 students and 43 intermediate adult learners at an English School examined the comparative impacts of three groups: input of non-negotiation, the input negotiation without output, and the input negotiation with pushed output. Each group did the Preliminary English Test, and 30 learners who obtained one standard deviation up and under the mean scores in the Preliminary English Test were selected randomly and divided equally to join the three groups. The entire treatment and procedure lasted ten sessions. Two tests - written and oral - were conducted after the treatment. The results showed that negotiation positively impacted the targeted L2 production and comprehension of lexical items. Input negotiation with pushed output did not improve second language vocabulary production more than input negotiation without output.

Lopez (2020) conducted a study to examine the influence of pushed output on L2 oral production of 16 7th grade English language learners at a private school in Colombia. The learners were placed randomly into a non-output group and an output group. The treatment lasted five

weeks, with the non-output group doing comprehension activities and the second one doing oral pushed output exercises. Mixed methods were used to gather the data: interviews, stimulated recalls and audio recordings. The outcomes showed that the learners were able to modify and change higher oral output in one-way pushed output exercises than in two-way exercises. They could also equalise their standardised syntactic and semantic competence as a result of being able to join in proceedings. Furthermore, the learners perceived oral pushed output to have an impact in the second language oral production and triggered L2 vocabulary, structure, and voicing exposure.

In sum, encouraging output appears to have a beneficial effect on vocabulary retention, underlining the potential value of the pushed output approach. But other factors, such as the overall learning environment, may also contribute to learning vocabulary, as well as the use of technology. In addition, encouraging the use of technology in an interactive environment may also encourage the development of the necessary cognitive functions for developing and retaining vocabulary and the ability to self-correct, as Jafari and Chalak (2016) noted. The rationale for this is that as the student is pushed to produce output and adjust and correct this, whether in a face-to-face or digital arena, there will be an increased accuracy and conciseness in their overall output, and an increased number of words will be used to express ideas, opinions and descriptions (Swain, 2000; Taj et al, 2017). What this suggests is that using technologies will provide a means for the students to not only engage in an interactive environment, but also give them the time to reflect on their language, as noted above. Although a face-to-face context provides many of the same opportunities as a digital environment, it is anticipated that the use of a digital medium will produce greater benefits due to the less pressured learning environment.

Previous studies (see above) have shown that pushed-output seems to lead to improved conditions for vocabulary learning. A small number of studies have focused on pushed output in learning vocabulary, as noted, but the contribution of the current study is that it offers a mixed methods research, with both qualitative and quantitative features, focusing on intermediate level Saudi Arabian English major undergraduates over the long and short terms, testing specifically abstract nouns and verbs because they are important for creating a short story (there is more justification for this in Chapter 4).

In the context of digital activities, particularly messaging applications, a number of studies have been conducted (Han and Keskin, 2016; Bensalem, 2018; Khan, 2016). However, these works focused on overall language improvement in areas such as motivation and spelling/writing, and

not specifically on pushed output or any variations between in-class and out-of-class improvements, although their findings did support the value of technologies in this area. A small number of studies have been conducted on technology messaging applications with learning vocabulary with pushed output, and the next sections will explain how they are relevant to the current study and also how they suggest that greater focus on specific aspects of pushed output is needed to extend existing research in the area of instant messaging applications as an EFL teaching resource. Therefore, the rationale for focusing on pushed-output is that increasingly EFL classrooms are adopting teaching methods which focus on activities, interaction and thus output. There is therefore an alignment with Long's (1981) interaction hypothesis, which proposes that second language learning is supported by face-to-face interaction and communication (Van Patten and Williams, 2014). Although the focus of the current study is on the medium of technology and not interaction, it is still pertinent to recognise that the interactive elements may contribute to psycholinguistic responses and the processing of the new language items and tasks. As such, understanding how these approaches can be enhanced with pushed-output using digital platforms outside the classroom has potential implications for teaching practice and has led to the focus of the current study. At the same time considerations needs to be given to the testing effect and then comprehension and production and how they influence learning and the use of vocabulary items.

3.5.1 The testing effect

According to several studies (Carrier & Pashler, 1992; Roediger & Marsh, 2005) on the testing effect, learners study several materials, take a pre-test, and then take a delayed test containing the same questions as the pre-test (that is to say: cues) and they are asked to retrieve the same utterances (targets). Some studies which have used this method (e.g. Roediger & Butler 2011; Keresztes et al., 2013) found that it can promote target language retention in intervals supposing the retrieved information's memory is strengthened. However, it is important to consider the degree to which this memorial advantage expands to non-restored information that is given in the exam, as the information or cues established in the cues.

Previous studies (such as Roediger & Karpicke, 2006; Roediger & Butler 2011) have noted that the advantage of vocabulary retention from testing is not limited to information recovered from the initial test. According to some studies (e.g. Chan et al., 2006; Chan, 2009), the effect of test extends to non-tested, but it is considered a piece of related information. There are other studies in which the information is strengthened over the testing process is transferable. Rohrer et al. (2010) stated this information could be utilised to respond clearly to various questions, while

Butler (2010) held it not only transfers flexibly to questions that have various answers, but can also transfer questions in various contextual fields.

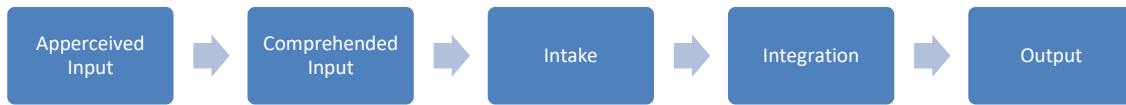
These studies (Barnett and Ceci 2002; Butler, 2010) showed that examining promotes memorial retention of non-tested cues from the research materials, and McKenzie (1972) promoted the transfer of the cues. These results (Carrier & Pashler, 1992; Roediger & Marsh, 2005) suppose that the facilitation of mnemonic testing is not accurate, particularly when the restored cues are tested under similar conditions, as in the initial test. If the associative connection between a target and a cue is strengthened, then an initial test could be devised to develop cue retention, even if the target one is utilised as a prompt. In fact, some studies have confirmed that cue retention is boosted after doing a test (McDaniel et al., 2007).

However, the influence of the testing effect suggests that long-term retention of knowledge is increased when there is testing during the learning process and effective feedback is provided (Roediger & Karpicke, 2006). For the current work, it is important that the vocabulary learned during the intervention is retained due to the testing approaches adopted and that the outcomes for those using email against those being taught with non-digital output methods are compared. The three groups in my study will be taught using the ‘levels of processing’ hypothesis (Craik & Lockhart, 1972), which states that an item is more likely to remain in the memory if a learner is more cognitively involved with it. This pedagogical method has received scant attention in the literature (Nation & Webb, 2011), which is surprising given that pushed output vocabulary learning activities are said to encourage the use of vocabulary, to aid learners to discover the meaning of unknown items, and to strengthen partially understood items through their productive use (Nation & Meara, 2010). Therefore, although the question of how productive activities help aid learners’ vocabulary learning is an important area of research, it is under-researched at present (Nation & Webb, 2011).

3.5.2 Comprehension vs production

Comprehension is the understanding of a range of lexical items and how they can be combined; in essence, how a student hears certain words and can comprehend what is being said. Production refers to the items and the combination of items that the student is able to use accurately and appropriately produce (Scovel, 1998). Models of language development and second language learning also recognise that comprehension precedes output. In the Gass (1988) psycholinguistic model, learning vocabulary moves through a number of stages (see Figure 2).

Figure 2: *Comprehension vs Production in the Gass psycholinguistic model (Source: Gass, 1988)*



What this suggests in terms of pushed output is that there is a stage in the process which can be leveraged - the integration stage. In other words, language support during this stage can lead to more rapid integration of the cognitive processes required to deliver accurate output. In the context of technology, there may be a role for it to facilitate this process due to the asynchronous and informal nature of the mediums, as well as other factors. As such, consideration of Computer Assisted Language Learning (CALL) and how it can assist in pushed output is required. The next section explains technology enhanced learning, covering the effectiveness of technology in learning pushed output vocabulary.

3.6 CALL Technologies and Specific Media

Whilst there is increasing recognition of the value of CALL technologies and how they can contribute to vocabulary knowledge - in terms of supporting greater awareness of errors, and retention of new words for example (Maftoon et al, 2015; de la Fuente, 2003) - the evidence is less clear about how specific mediums may impact learning outcomes.

Two decades ago, Warschauer (2001) described how language is being transformed because of new technologies and online media, and how a new set of literacies is emerging, including onscreen reading, hypermedia navigation, and online synchronous communication. It is generally agreed that knowledge of these new literacies is a key qualification for learners in the developed world (Golonka et al, 2014), and thus the integration of technologies which promote the use of these literacies is a necessary step for language teachers. At the same time, technology alone cannot lead to learning, and therefore understanding which technologies and applications are most suitable is a viable area of study, as is the arena of learning, due to the 24/7 availability of technologies such as email. The current study, rather than making a wider assessment and comparison of different technologies, which was deemed not feasible in the timeframe and with the available resources, focuses on identifying the role that the medium of email could play in encouraging enhanced vocabulary learning.

TELL may take various forms, including computer-assisted language learning (CALL), which employs technology like emails, chatbots, podcasts and games to facilitate language learning

both within and outside the classroom. According to research, employing technology in language learning may activate new cognitive processes, enhance learning and retention of information, and provide learners the freedom to study at their own speed and in their own time (Pilar et al, 2013; Shadiev et al, 2017; Howard and Scott, 2017). Using email to communicate with native speakers, for instance, may improve students' awareness of linguistic features, perception of cultural differences, memory of vocabulary and grammar, and language production abilities (Derakhshan & Hasanabbasi, 2015). However, not all technologies are equally effective for language learning, and some may even have detrimental effects on the motivation, confidence, and autonomy of language learners. Consequently, it is crucial to evaluate the suitability, quality, and impact of various technologies for various learners, contexts, and objectives (Chun, Smith and Kern, 2016).

Email has been found to have educational value in language learning due to its ability to motivate learners towards a goal, such as improving English language skills, and to permit dynamic learning (Barhoumi, 2015; Daniels et al, 2013; Fattah, 2015). Dynamic learning refers to the engaging and interactive character of the learning process that email communication facilitates (Absalom & Pais Marden, 2004). In addition, the informal nature of communications may be viewed as an extension of learning opportunities beyond the classroom (Wagner & Wilson, 2005). In the context of informal learning, the relationship between "casualness" and extending learning opportunities beyond the classroom can be investigated. Informal learning is defined as learning that takes place outside formal educational contexts, such as classrooms, and is frequently characterised by a casual and unstructured nature (Sacco et al., 2014). Such forms of learning include online learning communities, workplace learning, and experiential learning (Sacco et al., 2014; Sun, Franklin & Gao, 2017; Hegedi & Hus, 2020).

The use of email for language study is an example of informal learning outside the classroom. Nashruddin, Alam and Tanasy (2020) argue that the informal nature of email extends learning opportunities beyond the classroom. The time delay in replying to emails allows for reflection and correction prior to sending, reducing the strain on students (Han and Keskin, 2016).

Online learning communities are additional examples of informal learning outside the classroom (Sun et al., 2015). They provide a forum for individuals to share knowledge and discuss topics of common interest. An increasing number of such informal online learning communities provide support for learning outside the classroom (Sun et al., 2015).

Workplace learning is another type of non-classroom informal learning. In the contexts of teacher education, workplace pedagogy, and sport, concepts such as nonformal learning, informal learning, and incidental learning have been used to describe learning that occurs outside the official curriculum (Marsick & Watkins, 2001; Kyndt, Dochy & Nijs, 2009). These learning opportunities are distinguished by the significant role that colleagues play in the learning process (Marsick & Watkins, 2001; Kyndt, Dochy & Nijs, 2009).

The casual or informal nature of these informal learning opportunities can have a number of advantages. It can reduce anxiety by creating a more relaxed learning environment (Han and Keskin, 2016). In the absence of rigid structures and formal assessments, learners can also investigate and experiment with new ideas without fear of failure (Sacco et al., 2014). In addition, informal learning outside the classroom can provide students with real-world experiences and practical skills that are difficult to replicate in a classroom setting (Feichas, 2010).

Overall, informal learning opportunities outside the classroom, such as email language learning, online learning communities, and learning in the workplace, can provide valuable learning experiences. The informality and comfort of these learning environments can reduce anxiety, boost motivation, and facilitate dynamic and interactive learning. These opportunities for informal learning extend learning beyond the classroom and provide students with real-world experiences and practical skills.

Overall, the value of feedback in email communication extends to pushed output, where students actively generate language and receive direction. Email communication in ELT provides a valuable platform for feedback, allowing students to actively engage with pushed output and receive personalised instruction, augmenting the language learning experience.

With regard to incorporating technology into the language learning arena, CALL is one way. CALL is defined as a process of learning that crosses multiple contexts and applies social and content applications via personal technology communication devices (Pilar et al, 2013). The value of CALL in relation to the proposed work is that technologies such as email are used inside the class and students can read them again outside the class, extending the cognitive processes into new areas of learning. In short, using technology expands the arenas in which learners use and reflect on their second language knowledge. In essence, applying a different tool for learning may have the effect of activating new cognitive processes that encourage learning and retention of knowledge, as suggested by Shadieva et al, (2017). As a result, this type of learning can be beneficial as it is flexible: it overcomes the limitations of time and space and

empowers the learner to study whenever and wherever is most suitable for them (Howard and Scott, 2017). In a classroom context, moreover, the value of using such mediums as emails and texts is the perception of informality by students, which can constitute extended learning outside the classroom (Wagner & Wilson, 2005).

In the context of language learning, pushed output via email is a unique activity because it adheres to the principles of activity theory and can be contrasted with other activities that may be less valuable according to this theory. Activity theory serves as a valuable framework for understanding learning in various contexts, including language learning. It offers a descriptive tool to clarify the dynamics of learning activities rather than providing strict predictions or fixed ontologies (Rind, 2016).

To comprehend activity theory, it is essential to grasp key concepts that define an activity (Rind, 2016). By applying activity theory to language learning, it becomes evident that certain activities, like pushed output via email, align with the principles of activity theory and can be highly beneficial for learners (Robbins & Aydede, 2001).

Pushed output via email in language learning encourages active language production and meaningful communication, which taps into learners' intrinsic motivation (Robbins & Aydede, 2001). Research has shown that task-based language teaching (TBLT), which emphasises active language production, positively influences students' motivation and language proficiency (Robbins & Aydede, 2001). In addition, providing learners with autonomy and control over their learning process, as facilitated by emailed output, can further enhance motivation (Robbins & Aydede, 2001). This sense of autonomy allows students to actively participate in authentic communication, which is highly motivating (Robbins & Aydede, 2001).

Research by Pyc and Rawson (2009) examined the retrieval effort hypothesis, which suggests that higher memory levels correlate with increased difficulty in remembering information. They believe that retrieval practise enhances memory and learning. This gives credence to the idea that learning benefits from actively retrieving information.

Karpicke et al. (2009) looked at the significance of metacognitive techniques in student learning, concentrating on whether or not students utilise retrieval in their independent study. The findings indicated that during study, students can have illusions of competence that affect their approach to learning. The study highlights the importance of including retrieval practise in one's studies in order to achieve one's learning objectives.

Additionally, Leonard and Deevy (2020) examined how retrieval practise helps children with specific language impairment (SLI) and their classmates when they are developing to learn new words. They conducted out tests evaluating the efficacy of repeated study, repeated immediate retrieval circumstances, and repeated spaced retrieval. The findings indicate that retrieval practise enhances the word learning and retention of both groups. This strengthens the idea that language gaining benefits from retrieval-based practise.

Nonetheless, these references offer evidence that retrieval-based practise is an effective teaching method. According to the retrieval effort theory, increasing memory levels is an outcome of practising retrieval. The idea that retrieval practise enhances learning outcomes is further backed by research on word learning in children with SLI and metacognitive methods in student learning. As a consequence, introducing exercises that require active retrieval—like email-based pushed output—can improve language learning opportunities and advance language competency.

According to research (Huang, 2015), TBLT, which emphasises active language production, can have a positive influence on students' motivation and language proficiency. Intrinsic motivation, which is driven by curiosity and pleasure, plays a crucial role in language learning (Huang, 2015). This intrinsic motivation can be tapped by providing students with opportunities to express themselves and engage in meaningful communication (Huang, 2015).

In addition, motivation is a crucial factor for language learning success (Suryyasa, 2017). Various factors, including the quality of teaching and learning experiences, can influence students' motivation (Suryyasa, 2017). By providing learners with a sense of autonomy and control over their learning process, emailed output can boost motivation (Huang, 2015) by permitting students to participate actively in authentic communication, which can be highly motivating (Huang, 2015).

According to activity theory, activities that do not involve active language production, such as passive listening or reading, may be less beneficial. These activities might not offer the same level of engagement and interactivity as email-pushed output. Learners may not have the opportunity to practise and apply their language skills in meaningful contexts without active participation (Huang, 2015).

According to activity theory, pushed output via email is a valuable method for language learning. It encourages active participation, interaction, and meaningful communication, all of which are crucial for language development. Activities that do not involve active language production

may be less valuable because they may not provide learners with the same level of engagement and practise opportunities.

For Kim (2020), activity theory can alter a learner's relationship with the environment by incorporating his or her life into the learning process. In the context of language learning, email can be a tool to motivate students towards a goal, support their language development through activities such as writing and reading emails, and alleviate stress by allowing for reflection and correction prior to transmitting. Shang (2005) discovered that email dialogue journaling can enhance L2 reading performance. According to Saifullah (2018), task-based learning, which uses tasks or activities to enhance students' motivation and communicative language skills, is another approach that can alter the learner's relationship with the environment.

The present research looks at how students might improve their vocabulary knowledge by using email technology. While email is quick, the lengthier response time compared to face-to-face interaction allows time for contemplation and correction before sending, lowering pressure on students (Han and Keskin, 2016). The review time guarantees that the task may be concentrated on without feeling rushed to respond.

Although there were some similarities between the current study and research in Saudi Arabia by Al-Ahdal and Alharbi (2021), the latter focused on collaboration such as group activities (instead of the current study's focus on individual activities) and was based on solely pre-testing to post-testing in the short term. However, their findings do support the current study's focus on developing critical knowledge applications. The participants were 80 English undergraduates over three months at two universities: Qassim and Majmaah universities. The students used technology-assisted language learning as a means of collaborative education that showed enriched vocabulary memory. In addition, their study used a mixed-methods approach by examining pre-test and posttest outcomes over genders and getting direct instructor-learner feedback in surveys. However, the outcomes revealed that the empirical group's usage of technologies for collaboration assisted them to retain lexical items. Furthermore, after the intervention, the empirical group's performance was significantly enhanced, with more students achieving nearer to the mean value. When the group who had not received the intervention, no significant distinction in performance was seen.

Assessing this evidence in relation to CALL technologies, specifically email, the gap identified in relation to the current research appears to revolve around the role of technology in relation to pushed output processes and vocabulary learning. To explore this further and clearly define

the full research gap, some key areas in relation to technology and vocabulary need consideration.

3.6.1 Messaging applications: Affordances and applications in pushed output pedagogy

Effective pushed output requires, according to Swain (1985, 1993), constant practice, which means opportunities to reflect, identify errors, and correct based on previous input and knowledge. The value of using CALL technologies to present instructions and the creation of subsequent texts using target words and returning them by email in this process is that the initial messages sent can be reviewed (and thus reflected on), re-considered (error identification) and edited (correction) in the space of a few minutes. At the same time, respondents can also use the technology to ask for clarification without explicitly correcting the sender, which repeats the cycle of reflection, identification and correction necessary for accurate output. These activities can be undertaken in the classroom but can also be extended to additional learning outside the classroom. Furthermore, as Yao (2011) noted, during classroom usage, privacy, appropriacy and content management can be supervised; however, outside the classroom there is less control. It is interesting to note that Yao (2011) and Lauricella and Kay (2013) identified that motivation to use technology such as email outside the classroom was higher than during classroom sessions. Recognising that despite the lack of control and in mind of privacy/content concerns, the indications are that the continued use of technology outside the classroom does improve learning. There is also an argument for using an Instant Messaging (IM) app such as WhatsApp based on the fact that, like email, messages can be reviewed, re-considered and edited (applying reflection, error identification and correction process) in a short space of time. In addition, clarification can be requested without explicit correction. However, in comparison to email, the language on WhatsApp and similar technologies is more likely to be highly informal and instant, making them more synchronous than emails and with a shorter message length (Allagui, 2014). In addition, WhatsApp users are more likely to use emoticons than email users. However, within the scope and resources of the current work, email was still felt to be the most appropriate medium to adopt. The rationale and justification for selecting this medium over alternatives is that email extends what can be achieved in a classroom, as students can log in and respond in their own time and in a place they feel comfortable. Other digital mediums offer this capacity but email has additional specific benefits, including the potential to save and review the conversation at a subsequent date, as well as being more formal (Gonglewski *et al*, 2001). It is this formal element which makes email more effective in relation to assessing pushed output. Applications such as WhatsApp or other IM apps are associated by students with informal, social engagement, whilst email is seen as more formal in terms of the need to

accurately use English (Chalak *et al*, 2010). Therefore, encouraging the use of this medium ensures that there remains a focused, learning centred approach by the students which may not occur when using WhatsApp or other IM applications.

In terms of prior works in this area, So (2016) noted that for CALL approaches, either by themselves or as part of a technology enhanced learning process, to be beneficial, the first area to consider is the students' knowledge of the technology. At the same time, information should be provided in small chunks rather than as a whole learning experience to allow students the time to adjust to the new learning approach (Stahl *et al*, 2010). This highlights an additional benefit of using email as these can be short and succinct in instruction and information content. Part of the reason for this is that learners acquire knowledge at different rates and use different strategies, as Traxler (2009) highlighted. As such, the small, bite-sized approach gives them time to adjust their learning patterns to using technology inside and outside the classroom (Şahin Kizil, 2017).

De la Fuente (2003) studied English native speakers learning Spanish at elementary level in an intact second semester class. The researcher explored both face-to-face and Computer-Mediated Communication in acquiring L2 vocabulary meanings. The students were required to negotiate L2 vocabulary meanings and proved equally efficient at developing and acquiring written productive and receptive as well as retention of L2 vocabulary. Nevertheless, Computer-Mediated Communication negotiated interaction appeared to be less efficient at improving the oral learning of second language vocabulary, particularly if it improved the productive end of learning. The researcher found that learners who were asked to produce output outperformed those students who did input alone on productive vocabulary tests. The scholar advised that the deeper processing involved in output led to higher gains for these students in terms of the negotiation method of promoting second language vocabulary improvement throughout Computer-Mediated Communication, synchronous interactive activities.

A mixed methods study by Shang (2007), utilising both qualitative and quantitative research, explored the impact of utilising email on writing performance in grammatical accuracy, lexical density, syntactic complexity, and the relationship between writing performance and email exchanges. Forty intermediate EFL participants were selected from a reading class at a Taiwan university. The main results showed that learners performed better in grammatical accuracy as well as syntactic complexity. However, lexical density did not increase. Another result advised that swapping email messages with classmates at least four times could significantly improve their performance in writing. The learners' self-reports revealed that the email strategy was

beneficial for assisting the development of learners' EFL learning and attitudes. The study revealed a number of instructional implications for designing practical emails task to improve writing in the target language.

Another study, by Baralt (2011), discussed student anxiety by examining the impact of face-to-face and computer-mediated communications. Anxiety is an issue to consider as it can adversely impact student learning, and linguistically, being nervous can make learners more hesitant to speak. A counterbalanced, within-subject design was conducted with 25 intermediate Spanish learners completing two information-gap tasks with an instructor. Student anxiety was measured halfway through the activity, and after it was completed a preference questionnaire was given to the students. Unexpectedly, the outcomes showed that anxiety was not statistically weaker in the computer-mediated communication mode compared to the face-to-face interaction. Learners' anxiety was the same across modalities. The implications of utilisation and interactional modes for the learning contexts of a foreign language were explained and the perspectives of learner interaction in computer-mediated communication and face-to-face interaction modes were presented.

In another study, Maftoon et al. (2015) investigated the impact of CALL on learning vocabulary by 40 intermediate Iranian students of English. Aged between 16 and 18 years old, the students were randomly selected from a language school in Tehran and split into two 20-member groups. The experiential group was provided with VTS.S, a computer program for learning vocabulary, a computerised dictionary, and electronic instructor feedback. The control group used no specific software and vocabulary was taught utilising traditional methods using a paper dictionary. The results revealed that the group using VTS.S did better than the control group. Both high- and low-stake owners could benefit from the research results.

One of the purposes of Derakhshan and Hasanabbasi's (2015) study was to evaluate how Facebook, computer media and email are associated with learning English outside of the class. The investigators indicated that the second language is directly and incidentally learned through emails from second-language lecturers of other cultures. In addition, learners can use email to talk with their instructors or mother-tongue speakers. Their study proves that technology such as Facebook and social websites aids students to communicate with others. Moreover, computer media was considered beneficial for teaching those participants who were concentrated passively on learning English. The overview could finalise that social interaction through social networks is a stimulus for participants to talk with others.

Han and Keskin (2016) explored the impact of utilising WhatsApp in bachelor level L2 speaking classes on the speaking anxiety of learners. The participants were 39 learners who did exercises on WhatsApp in L2 speaking classes over four weeks. Their opinions regarding the exercises were then investigated in face-to-face interviews. The outcomes revealed that doing the exercises on WhatsApp significantly affected the learners' language learning by reducing L2 speaking stress and anxiety.

Çetinkaya and Sütçü (2018) conducted a mixed methods study looking at the impacts of Facebook and WhatsApp on learning English lexical items. The learners' performances in three groups - a WhatsApp group, a Facebook group, and a control group - showed significant variation across a pre- and a post-test. The highest effective increase in scores was in the WhatsApp group. The Facebook group also showed better outcomes than the control group. The conclusion was that such technologies can help to increase vocabulary learning.

Andrew et al. (2018) conducted a study to explore learners' views on using technology regarding deriving pleasure and seeing educational benefits vis-à-vis traditional learning with books, texts and documents. The results indicate that learners who experience enjoyment from learning with modern technology said such technology enhances their learning and allows them to prepare for forthcoming tasks. Paper documents such as books were the most favoured knowledge sources, and then technology came second sources. However, technology such as phones and tablets were less desired for academic studies. Moreover, the data showed that the participants desired to learn via a mix of traditional sources (texts and documents) and technical instruments (phones, tablets and computers).

Sun and Chang (2012) conducted an empirical study on the advantages of using a specific technology (i.e. blogs) for English language learners. They identified a number of advantages for learners, including how to deal with the pressures of education, gaining more knowledge and assisting in considering more reflectively how to exchange knowledge and information with other learners. Also, Sun and Chang (2012) stated that this specific technology inspires learners to improve their standards for higher instruction writing. However, in other studies (e.g. Campbell, 2003; Wu, 2006; Fageeh, 2011; Aljumah, 2012; Alsamadani, 2018) on attitudes towards using technology for learning English have identified a number of drawbacks for learners, including the quality of the internet connection, losing time with old/broken devices, and fear of losing the skill of handwriting, amongst other issues.

Along with increasing opportunities for pushed output, email technologies can also have a beneficial effect on writing, allowing students to use vocabulary items in their messages outside the classroom. Indeed, writing is feasible for most interactive call technologies, bringing together all the language skills and supporting metacognitive development of language ability, as Bouhnik and Deshen (2014) highlighted. Alongside these benefits of using email for vocabulary improvement, the autocorrect function on the majority of these mediums supports improvement in spelling (Allagui 2014). In terms of the value of using email in the classroom, Laurillard's conversational framework suggests that any technology brought into the classroom should be used to support and reinforce (rather than replace) the overall learning process and experience, building on conventional methods as a supplement to collaboration, discussion, production and articulation. As such, as Laurillard (2010) also noted, email can be beneficial for encouraging reticent students to engage in discussions and classroom activities and reduce anxieties about speaking, as already noted, underlining its value as part of a technology enhanced learning focus, even when used inside the classroom (as in the current research). Having defined the value of technology in encouraging vocabulary, additional consideration needs to be given to pushed output in the context of vocabulary learning.

The study focuses on a mental lexicon, recognising its role in vocabulary learning. This construct refers to the mental storage involved when using a language, and contains the words, associations and meanings that a person has with regard to specific lexical items (Richards & Schmidt, 2002). The approach is to examine what role the medium of email plays in enhancing retention of vocabulary. This is based on mental lexicons and their recognition of the mechanisms by which languages are processed and represented in the brain.

This approach recognises and aligns with Ellis and He's (1999) findings regarding the deeper processing that can be achieved with technology and the psycholinguistic stages identified by Gass (1988) in acquiring language. In effect, the suggestion is that the pushing of responses via email may encourage students to access their mental lexicon (storage of words and usage) to enable accurate language output or reflection and amendment of initial responses.

3.6.2 Justification of using email technology

For the current study, whilst numerous apps have the benefit of being used for sending messages, it was felt that email would be a more appropriate medium to use to investigate pushed output and vocabulary learning. Not only does email provide teachers with a level of control that may not be achievable with other technologies, it enables students to send their answers individually rather than as group responses because some students are sensitive about their

friends seeing their answers. This view was subsequently confirmed by Jou et al. (2017), who suggested that email has a high relevance in the EFL classroom. In addition, because email exchanges, although they can be immediate, are normally asynchronous (i.e. not occurring at the same time), the pressure to respond immediately reduced, alleviating anxiety and leading to improvements in the accuracy/complexity of the responses (Alemi et al, 2015). Furthermore, from the perspective of Vygotsky's constructionist learning approach (Zimmerman, 2013), the use of tools to facilitate learning is a common pedagogical approach, and email can be seen as a technological extension of this approach to encouraging and pushing output (Rambe and Bere, 2013). As a result of these variations, email was selected for use in the current study.

Email was selected as a technology which can push learners to use target vocabulary items in their output. Using email as a teaching tool as part of a technology enhanced approach is highly efficient in terms of teacher time, as one email can be sent to multiple students with the target words (Pirasteh, 2014). From the students' perspective, receiving instructions via email allows them time to read, reflect and consider their answers at their own pace without classroom pressure (Maftoon et al., 2015). The adoption of CALL will, however, be combined with teaching to provide an overall technology enhanced learning approach. Furthermore, adopting the use of email and text responses as a learning resource outside of the classroom could enhance students' motivation as there is evidence that email messages or text/type, rather than undertaking non-typical classroom activities, is seen as less psychologically taxing (Nomass, 2013). This provides another rationale for the use of email for a study of pushed output. Again, whilst technologies such as WhatsApp can also provide these benefits, as indicated, the informal nature of WhatsApp and the use of emoticons makes it a less viable for formal learning compared to email. Furthermore, there are more likely to be revisions/corrections when using technology, as identified by Pennington (2013). Similarly, according to Basterrechea et al. (2014), asking for clarification in a manner that does not provide the word that the student is searching for leads to them reflecting and accessing their knowledge to find the correct word.

3.7 Research Gap

Although numerous studies have examined how messaging application technology enhances the effects of digital based activities inside or outside the classroom (East & King, 2012; Bollen et al, 2012) and impacts the learning environment (Grgurovik, 2011) for the learning of vocabulary, the current work fills a specific gap. It combines vocabulary and pushed output with messaging application technology and is focused on adult undergraduates in English, with a focus on writing. In the wide body of research on language learners, only one study has looked

at pushed output and messaging application technology and vocabulary learning with undergraduate students at university level (De la Fuente, 2003). However, that study focused on Spanish learners acquiring the meaning of nouns, in contrast to the current study's focus on English learners studying verbs and abstract nouns to build stories. Other areas of study – i.e. such as technology, technology and language, and pushed output – have, however, been examined independently (Razak et al, 2013; Alsaleem, 2013; Allagui, 2014).

The current research gap fills a context gap in Saudi Arabia with regard to technology and ESL pedagogy in the country, applying a mixed methods study that compares the effects of technology in learning English vocabulary, specifically writing by intermediate English major undergraduates at a Saudi university in the short and long terms. The research can also fill a gap in the UK, whereby EAL teaching, in both schools and language centres, has been expanding due to a large number of second language learners arriving (pre-Brexit) from Eastern Europe, Iraq and Afghanistan. Teaching was dramatically impacted by the advent of the Covid pandemic, which led to online teaching through email and applications such as Zoom. Therefore, research on EAL teaching using new technologies suddenly became of great import, not only in Saudi Arabia, but also worldwide.

Although a number of studies have been conducted in the USA and South America (such as the aforementioned Lopez 2020 paper), there are gaps in this area in the UK as well. Only one research paper has addressed this subject matter, namely Arnot et al.'s (2014) paper for the Refugee Council. However, this paper was school based and considered school EAL pedagogy, making connections to incorporating technology but not specifically pushed learning. In Saudi Arabia, only one study can be considered in the field, namely that of Al-Ahdal and Alharbi (2021). However, their study focused on collaboration as group activities instead of individual activities, in contrast to the current study. Their study also focused solely on the short term in the form of pre-testing to post-testing, unlike the current study's focus on the short and long terms from pre-testing to post testing and from pre-testing to delayed post-testing. Therefore, this PhD dissertation will address a number of existing gaps in the literature and some issues that have not received the attention they warrant, if any at all. As already noted, there is a lack of studies on the learning of vocabulary by university ESL students with a focus on learning and testing vocabulary knowledge through pushed output over the short and long terms. Moreover, the dissertation is innovative in adopting the pushed output hypothesis in combination with technology (namely, email) to design course materials and test vocabulary through a vocabulary knowledge scales and a productive knowledge test in terms of verbs and abstract

nouns. In addition, the dissertation contains a qualitative analysis of use, which is an examination of Engber's (1995) taxonomy of lexical errors based on two dimensions: lexical choice and lexical form. The analysis is based on 27 writing samples obtained from the participants; each student produced nine writing samples over the course of weeks 1, 3, and 5, with three samples for each of the three conditions (pushed class, pushed email, and non-pushed class) for each week. In these ways, it is hoped that the present study will provide original contributions to the relevant pedagogical literature.

3.8 Chapter Summary

This chapter has reviewed the relevant literature on lexical items and their importance. The chapter also highlighted the status of vocabulary knowledge for teaching a second language and provided an overview of the main discussions and considerations in the relevant research, such as depth and breadth and how they relate to how lexical items constitute the mental lexicon of learners and how L2 vocabulary knowledge can be measured.

Moreover, the chapter has reviewed the relevant literature on input and output and explained pushed and non-pushed output in the context of the potential benefits of technology enhanced vs non-technology based vocabulary learning. Then, a literature review of pushed output and technology in learning vocabulary was undertaken, providing an evaluation of the relevant theories. An overview of the primary theory to be tested within the context of this work – the mental lexicon– was given, with a focus on how this approach recognises the way that languages are represented and processed. Specifically, the effects of the use of and engagement with email technology and how this may contribute to deeper learning when combined with pushed output was considered. Whether cognitive activities encouraged by email feedback and thus reflection, correction and amendment on production lead to enhanced vocabulary learning and longer term retention was also discussed. In essence, based on the mental lexicon, the current study will examine whether pushed output (feedback via email) using technology supports access to the mental lexicon and thus accurate output or, where necessary, reflection on and correction of initial answers. This will be compared with the level of reflection/correction that occurs when no technology and no pushed output (i.e. no feedback from teacher) are available to students. The participants will be tested on the level of vocabulary knowledge achieved and retained over a set intervention period.

This research draws on two major theoretical frameworks: the output hypothesis and the mental lexicon theory. The output hypothesis, proposed by Swain (1985; 1993), claims that producing language (output) facilitates language learning by stimulating cognitive processes that enable

learners to notice gaps in their knowledge, test hypotheses, and receive feedback. The hypothesis does not deny the importance of input for learning receptive language skills, but it emphasises the role of output for developing expressive language competence, which is the ultimate goal in an L2 classroom. The output hypothesis is consistent with psycholinguistic theories that posit a dynamic interaction between input and output in the development of the mental lexicon, which is the mental representation of words and their meanings, forms, and associations (Gass, 1988; Ellis & He, 1999). Numerous studies have demonstrated the positive effects of output on various aspects of language learning, such as grammar, vocabulary, pronunciation, and fluency (Izumi, 2002; de la Fuente, 2002; Storch & Wigglesworth, 2003; Swain & Lapkin, 2005). The function of output in enhancing skills and expertise is therefore well-established in the field.

In addition, the study investigates the function of technology as a possible tool in language classrooms for both students and teachers (Pirasteh, 2014; Shadiev et al., 2017). Technology, including email, facilitates self-directed learning, which has been found to improve L2 learning and retention (Chapelle, 2007). However, to the best of my knowledge no study has examined whether technology, specifically email, can be effectively combined with the concept of pushed output to enhance vocabulary learning in a classroom of adult learners of ESL.

To address this gap, this study will investigate the potential of pushed output (feedback via email), enabled by technology, hypothesising that it will support access to the mental lexicon, accurate output, reflection, and correction of initial answers. The primary goal is to improve vocabulary learning and retention over time. During the intervention period, the knowledge learnt and retained by the study's participants will be evaluated qualitatively and quantitatively using a vocabulary knowledge scales test, a productive knowledge test, a two-part questionnaire, a quantitative analysis of vocabulary size according to Meara and Miralpeix (2016), and an analysis of lexical errors based on Engber (1995)'s taxonomy.

This research acknowledges the value of technology in fostering self-directed learning and seeks to bridge the knowledge gap on how technology-enhanced approaches can improve vocabulary learning outcomes. With the belief that findings from the Saudi context can be generalised globally, the emphasis is on accumulating English vocabulary through written skills. The study's research methodology will be detailed in the following chapter.

Chapter 4. Methodology

4.0 Introduction to the Chapter

This chapter is organised as follows. In section 4.1, the research questions and hypotheses set out in the introduction are refined and reiterated. Section 4.2 considers the study's philosophical underpinnings. Section 4.3 elaborates on the research design and explains the study's mixed methods and quasi-experimental design in detail. Section 4.4 provides information about the participants. The next section explains the dependent and independent variables of the research. Section 4.6 details the vocabulary knowledge scales test, the productive test. The data collection procedures are then described in Section 4.7. Section 4.8 describes the quantitative analysis of the current research data. The qualitative analysis - including analysis of students' writings, analysis of lexical errors, and ChatGPT for lexical errors, word selection, and ratings - are described in Section 4.9. Section 4.10 explains the questionnaire. Section 4.11 examines the reliability of the study. Section 4.12 examines the internal and external validity as well as the fidelity of the study. Section 4.13 discusses the ethical issues raised by the study, including the information sheet and the consent form. The pilot study of the investigation is described in section 4.14. Finally, section 4.15 summarises the chapter.

4.1 Research Questions and Hypotheses

4.1.1 Research questions

This research will attempt to resolve the following questions:

1. *Is there a difference in the vocabulary used in the short and long terms through participation in a non-pushed output class and a pushed output class?*

This question assesses whether there is an observable effect of pushed output when using English vocabulary in short-term (from pre-test to post-test) and long-term (from pre-test to delayed post-test) gain scores in writing, compared to a non-pushed class. In addition, it investigates the target vocabulary's usage at different time points.

This first main research question incorporates the following sub-questions:

- 1a. *Is there a difference between the use of pushed output using email for students' vocabulary skills and participation in a pushed output class without email in the short and long terms?*

This question evaluates the role of pushed email and its contribution to language learning in terms of short-term (from pre-test to post-test) and long-term (from pre-test to delayed post-test) gain scores in writing, compared to a pushed class. In addition, use of the target vocabulary in timepoints is considered.

1b. Does the use of the combined effects of email and pushed output provide additional improvements to students' vocabulary skills over the short and long terms?

This question (1b) evaluates whether email supports and enhances the process of pushed output. It also determines its contribution to language use in terms of gain scores and use of the target vocabulary in writing at pre- post and delayed post timepoints. It is difficult to measure question (1b), but the effect size is used to calculate the analyses of research question 1 and question (1a) (to determine if pushed output and email have greater what than expected) in order to answer question (1b).

2. What are students' experiences of and attitudes towards studying vocabulary using email as part of a technology enhanced learning approach to use vocabulary?

The first main question and its sub questions were answered via a quantitative approach by evaluating test outcomes and a qualitative approach by examining the target vocabulary in timepoints. The second main question was focused on quantitative and qualitative data from the students and was then used to evaluate whether their views were aligned with the outcomes of the test scores.

4.1.2 Hypotheses

The following hypotheses are derived from a thorough examination of the literature review and leading theories in the field:

Hypothesis 1: There is a statistically significant difference between the gain scores of pre-testing and post-testing of students who have participated in a pushed class and students who have participated in a non-pushed class.

Hypothesis 2: There is a statistically significant difference between the gain scores of pre-testing and post-testing of students who have participated using pushed email and students who have participated in a pushed class without email.

Hypothesis 3: There is an effect size between the gain scores of student pre-tests and post-tests when using a combination of email and pushed output compared with students only studying in a pushed output class without email.

In terms of delayed post-tests for the three hypotheses above, there is a significant difference between the gain scores of pre-testing and delayed post-testing, considering that the long term retention of language knowledge by students needs to be assessed by regular formative testing (Shafaei & Abdul Rahim, 2015; Amin & Mojavezi, 2017), and the delayed post-tests demonstrate a favourable outcome for vocabulary retention of students (Altalhab, 2018).

Hypothesis 4: There is a considerable difference between the vocabulary size of students who have participated in a pushed email condition and those who have participated in a pushed class or non-pushed class condition.

In addition to quantitative hypotheses, qualitative analysis contains hypotheses derived from the literature review and research queries. The qualitative analysis is based on the second segment of the questionnaire and an analysis of lexical errors according to the taxonomy of Engber (1995). The analysis is based on 27 writing samples collected from the participants, with each student producing nine samples in weeks 1, 3, and 5, with each week containing three samples for each of the three conditions (pushed class, pushed email, and non-pushed class). The following qualitative hypotheses are tested:

Hypothesis 5: Over time, there is a significant improvement in the lexical choices and forms of students exposed to pushed email, pushed class, or non-pushed class conditions.

Hypothesis 6: Students' experiences with and attitudes towards studying vocabulary via email as part of a technology-enhanced learning strategy to use vocabulary are positive.

4.2 Considerations of Philosophical Underpinnings

The current research is grounded in a pragmatic research paradigm and employs an appropriate mixed methods design. The advantages of positivist and constructivist approaches to epistemological and methodological questions can be taken advantage of by mixing methods, while the disadvantages of using only one of these approaches are avoided (Teddlie and Tashakkori, 2009). The pragmatic paradigm sidesteps contentious and seemingly endless discussions about 'reality' and 'truth' by positing the possibility of multiple realities or truths, each constructed socially and only discoverable through empirical inquiry into 'what works' in particular circumstances or for specific communities (Teddlie and Tashakkori, 2009). The following paragraphs

provide a concise overview of the two paradigms that permit the mixing of methods in a research project – positivism and constructivism – and justify the selection of pragmatism as the governing paradigm for this study.

Positivism is one paradigm in education research. Cohen et al., (2013) stated that positivism is associated with the scientific method and aims to objectively quantify and measure social phenomena in a value-free manner. Positivism holds that knowledge and actuality can be measured using specific methods, such as experiments and surveys. The positivist paradigm is fundamentally founded on the objective verification of generalisation, replication, and the identification of laws or relationships using controlling variables, with the aim of connecting these variables and impartially proving or disproving hypotheses (Punch, 2013). Positivism is founded on a realist ontology, which posits an objective, opinion-independent social reality. In addition, positivism is rooted in an epistemology of objectivism that maintains the separation of investigator and investigated, as well as research and the outside world (Cohen et al., 2013). The positivist paradigm views human research subjects as predetermined, inert, and under control (Mangan, Lalwani & Gardner, 2004).

Another research paradigm in education is constructivism. Constructivism is associated with the interpretive method, which aims to comprehend and explain context-sensitive social phenomena (Cohen et al., 2013). Constructivism assumes that knowledge and reality are created by the interactions and interpretations of human actors. The constructivist paradigm is fundamentally based on the subjective exploration of meanings, perspectives, and experiences, employing flexible and emergent methods like interviews and observations (Punch, 2013). Constructivism is founded on a relativist ontology, which holds that multiple realities exist based on the perspectives and values of various individuals and groups. In addition, constructivism is rooted in an epistemology of subjectivism, which holds that the researcher and the investigated are inseparable and that research is influenced by the personal and social contexts of both (Cohen et al., 2013). The constructivist paradigm considers research participants to be active, inventive, and pensive.

The pragmatic paradigm focuses on ‘what works’ to answer the questions designed to investigate a subject or matter (Teddlie and Tashakkori, 2009). It permits the combination of the positivist and constructivist paradigms within a single research project. Pragmatism is founded on the belief that meaning and truth are derived from the practical results of research. Pragmatists maintain that, although an objective reality exists apart from human experiences, this reality is rooted in the environment and can only be known through human experience (Tashakkori and

Teddle, 2008; Morgan, 2014). According to Yefimov (2004), the central tenet of the pragmatist viewpoint is that reality and knowledge are rooted in the behaviours and beliefs of individuals and are therefore socially created. All understanding, according to Morgan (2014), is socially constructed, but some social structures suit some people's experiences better than others, and are, in essence, culturally bound and dependent on what works in that particular culture. Utilising the respective benefits of the interpretivist and positivist approaches to research, the current study examines how these two paradigms facilitate mixed methods research.

The current study's selection of pragmatism as its governing paradigm is justified by the nature of the research problem and the study's objectives. The research problem involves examining the effects of three distinct vocabulary learning activities on vocabulary use and retention, as well as learners' perceptions of and attitudes towards these activities. The research objectives include measuring learners' vocabulary gains with tests, exploring learners' experiences with questionnaires, and understanding learners' perspectives with open-ended questions, and then analysing the students' writings quantitatively in terms of vocabulary size and qualitatively in terms of errors in lexical choice and forms. These objectives necessitate a combination of quantitative and qualitative approaches to address various facets of the research issue. The pragmatic paradigm permits the researcher to employ both methods without being limited by philosophical debates or methodological preferences. In addition, the pragmatic paradigm enables the researcher to combine the findings from both methodologies to provide a comprehensive and applicable answer to the research query.

The research employed three distinct methods: examinations, questionnaires, and an analysis of student writing. The vocabulary gains of students across three distinct activities and conditions were measured using tests, allowing for straightforward comparison of results. Utilising standardised and efficient questionnaires, participants' experiences and opinions regarding the activities were explored. The responses to open-ended queries revealed the reasons for preferences, vocabulary learning strategies, and perceived benefits and drawbacks of each activity. Additionally, the researcher compared the use of assigned vocabulary in the writings of students at various experiment points. These meticulously chosen methodologies provided in-depth insights into the impact of activities on vocabulary learning and participant experiences and perspectives.

4.3 Research Design

With respect to this study's research design, the aim is to compare three conditions in relation to their effects on three groups; thus, the research describes and compares these three conditions

(pushed email, pushed class and non-pushed class), from which the outcomes of the three conditions among the three groups will be explained.

The current research aims to explore whether any of the three conditions has an observable effect on participants' use of target vocabulary. In order to compare these three conditions (to recap: taught via traditional methods without pushed output, learning in a class with pushed output and learning using email with pushed output), a within-subject design is used so that all the participants experienced each condition, presented in a different order. The variables used for each group are considered in Section 4.5.

In addition, a mixed-methods case study examining the attitudes of students towards email as a technology-enhanced tool for vocabulary development. It captures data using Likert scales and open-ended queries and contrasts the use of assigned vocabulary in students' writings at various experiment phases.

4.3.1 Mixed methods

This study deems that a mix of qualitative and quantitative methods would generate more comprehensive insights into the research subject than either solely qualitative or quantitative methods. Stake (2005) used the term 'mixed-methods research' to refer to a multi-method approach to collecting research data. Creswell (2003) stated that the term commonly includes several quantitative and qualitative methods of gathering and analysing data. Mixed methods research is undertaken to avoid the well-documented pitfalls of adopting a single method, either quantitative or qualitative.

To identify and consider the impact of pushed output, pushed email, and non-pushed output in learning English vocabulary, this study draws on my own experiences and the situations I encountered while teaching English writing at a university in Saudi Arabia. The study requires testing receptive and productive vocabulary; therefore, all the achievements in the VKS test and the productive test generated numerical data to provide answers to the first main research question and sub-questions 1a and 1b. In addition to these tests, writing students samples were also used to assess productive vocabulary, particularly in terms of lexical choices and forms qualitatively and vocabulary size quantitatively to answer the first main research question and sub-questions 1a and 1b. The participants' writing samples were collected in weeks 1, 3, and 5, with each student producing three samples per condition for a total of nine per condition across the 27 scripts. The writing samples were analysed qualitatively using Engber's (1995) taxonomy of lexical errors and quantitatively using the V Words website developed by Meara and Miralpeix

(2016). Data for the second main research question were derived from answers given to the questionnaire, which has two sections - one consisting of a Likert scale and analysed quantitatively using SPSS, and the other consisting of open-ended questions and analysed qualitatively. In this way, all the research questions were answered in both quantitative and qualitative ways. This mixed-methods design thus generated data from the perspective of a pragmatist research paradigm.

The advantages of a mixed-methods research paradigm have been explored by numerous academics. Denzin and Lincoln (2005) stated that mixing methods allows researchers to avert relying on a single research approach to seek answers to set research questions. This method enhances the validity of a study's findings by investigating them from various views and seeking complementarity. 'Triangulating' data this way means that the benefits of each single method deployed strengthen the overall validity of the research's findings.

Although a mixed-methods approach may raise numerous obstacles, such as the increased time involved in qualitative aspects of the research, the current research assumes the study's results are strengthened by drawing on the advantages of each of the two approaches, with the 'dry facts' of the objective quantitative data being explored in detail using qualitative methods. It is hoped that the mixing of these two methods will generate a fuller, more comprehensive picture of students' experiences using technology to learn English vocabulary.

4.3.2 A quasi-experimental

Experimental research has two major classes: true experimental design and quasi-experimental design. These designs demand treatment manipulation, and though quasi-experiments do not demand random assignment, true experiments do (Gribbons and Herman, 1996). Gribbons and Herman (1996) stated that quasi-experiments are used when a researcher cannot utilise random assignment. A quasi-experimental study was conducted in the current research, consisting of treatment groups of pre-formed classes, a common aspect of teaching intervention studies. Bryman (2012) stated that a quasi-experimental study seeks to decide if the intervention had the expected impact on the participants of the study. The advantages of a quasi-experimental study reside in its practicality. The current study is more ecologically valid, which leads to a better generalisation.

As explained earlier, the major dissimilarity between these two designs is that the participants are randomly assigned in a true experiment. In any case, Bryman (2012) noted that random assignment is not always possible. For instance, in the current study examining the impacts of

an email intervention on the learning of undergraduate students, it would have been impractical to ask the university to randomly separate the students into three different classes for long periods of time. Moreover, it would not have been realistic to ask the university to do so at the beginning of the semester for five weeks and then ask the university to divide them into the same groups again for another week five weeks later. A pre- and post-test quasi-experimental design is an experimental stage in order to occupy in the actual globe when such random assignment is not practical (Handley, 2018). The students in the three groups were from intact classes (Ary et al., 2010) at Albaha University; this decreased the time and resources expended on the randomisation and pre-screening, which in turn allowed for creating a more normal setting to track any developments in the students' achievements (Mackey & Gass, 2016).

The quasi-experiment was conducted to explore whether there was a major significant difference between the three conditions - pushed output by email, pushed output in classroom without email, or non-pushed output - in terms of learning vocabulary. Table 2 presents some details on how this was achieved.

In this study, a counterbalanced design was utilised to compare the learning outcomes of three conditions: those taught using traditional methods without pushed output, those taught in a classroom with pushed output, and those taught via email with pushed output. To compensate for ordering effects, such as performance variations over time (Mitchell & Jolley, 2012), a counterbalanced design was selected. The counterbalanced design ensured that each participant experienced each condition in a distinct order (Meschyan & Hernandez, 2002) by randomly assigning the order of conditions across the participants.

The results of an experiment can be significantly impacted by ordering effects. For instance, if the participants were exposed to the same condition first, they might demonstrate a primacy effect (greater recall of the first items) or a fatigue effect (worse performance due to tedium or exertion) (Meschyan & Hernandez, 2002). Alternately, if they were subjected to the same condition last, they could demonstrate a recency effect (greater recall of the most recent items) or a practise effect (enhanced performance due to familiarity or learning) (Meschyan & Hernandez, 2002). These ordering effects may confuse the results and obscure the true influence of the various conditions (Meschyan & Hernandez, 2002). This between-subject design ensured that each participant would experience each condition in a distinct order.

As shown in Table 2, there were three groups and three sets of target vocabulary for comparing students taught using traditional methods without pushed output, in a classroom with pushed

output, and via email with pushed output. According to Lyster (2007), any research on teaching interventions should employ a counterbalanced design to give L2 learners the chance to comprehend and discuss language over the taught activities.

Chen, Chang and Chen (2023) contend that counterbalancing is a crucial instrument in experimental design because it can help control for effects that may result from the sequence in which conditions are administered. This method can also reduce the influence of practise effects, weariness, and other extraneous variables that may have an effect on the results. Swain and Lapkin (2000) also emphasised the significance of counterbalancing in research on second language learning, as it allows for the control of practise effects and the reduction of the danger of order effects.

In conclusion, the study's use of a counterbalanced design ensures that the results accurately reflect the learning outcomes of the three groups and are not influenced by ordering effects. This design is an essential instrument for controlling order effects in experimental research and enhancing the reliability of results.

Table 2: Stages of the teaching intervention

	Word Set 1 (6 words every week)	Word Set 2 (6 words every week)	Word Set 3 (6 words every week)
Group 1	Pushed Class	Non- pushed class	Pushed email
Group 2	Pushed email	Pushed Class	Non- pushed class
Group 3	Non- pushed class	Pushed email	Pushed Class

4.4 Participants

Three groups of female Saudi adult EFL students ranging in age from 20 to 24 were recruited from three third-year English specialisation classes at Qilwah college of Arts and Sciences, Albaha University, Saudi Arabia, during the first semester of the academic year 2019-2020 (beginning in September and ending in late November). These students did not have a background in languages and were Arabic native speakers who had begun to study English as a major on their current courses at Albaha University.

4.5 Dependent and Independent Variables

The independent variable in this research consists of three conditions: pushed email, pushed class and non-pushed class.

The dependent variables comprise gain scores from the pre-test to the post-test and score gains from the pre-test to the delayed post-test according to vocabulary knowledge as measured by the VKS (receptive knowledge) (see Section 4.6.1) and productive knowledge as measured by sentence completion (see Section 4.6.2).

4.6 Tests and Materials

It is important to test participants' previous knowledge of target items (Nation & Webb, 2011). Therefore, pre-tests were conducted using both a VKS test for receptive knowledge and a productive knowledge test (see below). The questions in the pre-test, post-test and delayed test were arranged by the researcher according to the lexical items from the 10 units and then provided to the learners. A total of 90 target words introduced gradually over five weeks across the three groups - 18 words weekly and six words per treatment. As the entire treatment was five weeks, I chose 10 from 30 units in the book based on the class's timetabling.

The words selected for the tests were a combination of abstract nouns and verbs based on the language levels identified in the students' level in their third year. Tomasello (1992) stated that verbs are an essential part of speech which lead to the successful development of complete sentences. Verbs have also been seen as critical for learning language because they allow learners to begin understanding how to build sentences successfully; every sentence requires a verb, and the verb one chooses often defines the sentence. Bird, Franklin, and Howard (2001) stated that abstract nouns, also necessary for sentences, are learned at the same time as verbs because one is conceptual and the other is tangible. As such, these are the two forms of verbiage that will be focused on.

The features described above give further support to Skinner (2019) and Lopez (2020), both of whom noted the importance of verbal instruction or different delivery of instructions given in the context of pushed output. When considering specifically verb conjugation and the use of nouns, certain languages share certain root words or even similar sounds for the same word within their respective vocabulary. Hearing a verb in one's own language and a sentence in another may allow learners to infer what verb or noun use is best changed or otherwise corrected to ensure the sentence makes sense. It has become increasingly clear as research continues that pushed output environments are best suited for language learning, but there remains much to discover on the various ways this environment can be optimally utilised. Encouraging output and independent learning, as well as critical thinking skills, will also help students best address their strengths and weaknesses in language learning (Wei, 2018). Saudi students could then be expected to do better in the process of learning if encouraged to take independent responsibility

for their efforts, either by reading and writing emails, writing stories, or, potentially, speaking. Upon receiving feedback, they become adept at incorporating that feedback into different responses or answers in the future.

The three groups were taught by the lecturer of the course. Three groups were chosen because there are three groups in the English Department of Qilwah College of Arts and Sciences at Albaha University, each year. The learners in the three groups took a pre-test to determine target vocabulary level before beginning the treatment, and the two tests, one being a post-test at the end of the treatment to assess the participants' achievements between the three conditions, and the other a delayed test in order to measure the retention of the participants' lexical knowledge. The time between each test was five weeks to minimise the impact of the three conditions on the findings pertaining to the treatment.

4.6.1 Test of Productive Knowledge

The test of productive knowledge made use of Laufer and Nation's (1999) production test. This test focused on controlled production as a measure of productive vocabulary through the administration of five frequency levels and the adoption of completion items such as "*the garden was full of fra _____ flowers*". The student then completes the phrases based on their productive ability. The value in using this approach is that it can be aligned with the VKS to identify where there are gaps in the students' comprehension and production vocabulary knowledge at the pre-post and delayed stages and whether the intervention with email makes a difference to any identified gaps.

The number of letters for each word eliminates possible alternatives to the tested lexical item. The exam in this study utilised the initial half of a lexical item with the smaller number of letters being supplied if the word/lexical item had an odd number of letters (e.g., the initial two letters were supplied if the word consisted of five letters). Because this task involved testing productive vocabulary knowledge, it was deemed more appropriate to supply the minimum number of letters to remove uncertainty of meaning from the cue. If two letters start with two potential words in the special sentence, an additional character was added to eliminate this possibility. The size of the underlined space, at the ending of each lexical item that is not finished, is no clarification of the number of letters required to finish it.

4.6.2 Vocabulary Knowledge Scale (VKS)

The VKS test devised by Wesche and Paribakht (1996) is a four-point scale designed to measure the strength, size, and depth of the vocabulary knowledge of L2 learners. The test evaluates participants' ability to recognise, use, and comprehend vocabulary in context.

The examination consists of a variety of vocabulary-related tasks, such as multiple-choice recognition, definition matching, sentence completion, and text comprehension. The results provide information regarding the number of vocabulary words known, the frequency with which they are used, and the depth of comprehension of word meaning.

The VKS test has been extensively utilised in L2 research, and its reliability and validity have been confirmed. For example, Smith et al. (2015) used the VKS test to investigate the effect of vocabulary instruction on the vocabulary knowledge of language learners. Johnson and Brown (2018) used it to examine the correlation between vocabulary size and reading comprehension in L2 learners. These studies demonstrate the pervasive use of the VKS test in L2 research and emphasise its significance in shedding light on English language learners' vocabularies.

Self-report scales are frequently used in vocabulary knowledge tests because they are a fast and convenient way for individuals to evaluate their own vocabulary knowledge (Cohen, Manion, & Morrison, 2011). This type of test provides valuable insights into the vocabulary proficiency of individuals and is frequently used to collect data on the vocabulary knowledge of large populations (Nation, 2001). In addition, self-report evaluations are simpler to administer and score than multiple-choice tests or written assessments (Cohen et al., 2011).

As a self-report instrument, the VKS test is beneficial for measuring subtle increases in vocabulary knowledge, especially written vocabulary. It recognises that vocabulary use is a gradual and incremental process and that word knowledge is multifaceted. One of these is recognition memory or passive vocabulary, which is a key indicator of lexical competence. Due to the fact that it assesses partial knowledge of lexical items, the VKS test is suited for measuring vocabulary improvement precisely. The assessed levels of knowledge for the target words are presented in Table 3.

Table 3: Vocabulary Knowledge Scales

1	I don't know what this word means
2	I have seen this word before, but I can't remember.
3	I know this word. It means (Synonyms or translation)
4	I can use this word in a sentence. (Write a sentence)

Source: Wesche and Paribakht (1996).

As Table 3 shows, the scale classifications range from complete unfamiliarity, little knowledge of the lexical item, little idea of the word's meaning and the ability to appropriately utilise the lexical item in context with semantic and structural accuracy (Wesche and Paribakht, 1996). The scale essentially measures the advanced degrees of word knowledge. Level 1 determines what the learners do not know about the lexical item, while levels 2, 3 and 4 measure their recognition of the lexical item. While the participants provide proof of their knowledge, the score given to that exam item is already decided by a relocation of scores, as reported by the categories demonstrated above. Every participant was given target vocabulary lists and shown how to illustrate his or her level of knowledge for each, how to self-report levels 3 and 4, and how to present her knowledge. VKS scoring gives categories 1 and 2 to give scores 1 and 2 for self-reported word recognition, meaning the participants did not know the lexical items but they needed more knowledge to get higher scores. A score of 2 was given to categories 3 and 4 if they were answered incorrectly in the self-report. If the translation or synonym was correct in category 3, then the score became 3, and if the sentence was correct in category 4, then the score became 4.

4.7 The Administration of the Data Elicitation Tools

The vocabulary items were taught to the students using three distinct methods, one for each group. Table 2 shows that 90 target words were introduced over the course of five weeks, with 18 words taught weekly across the three treatment groups and six words per treatment. The researcher selected the lexical items for the tests described in sections 4.6.1 and 4.6.2 from the book "4000 Essential English Words" (Nation, 2009).

Each group had a set of target words, with 90 words divided into three sets of 30 words. To eliminate any ordering effects, the words were presented in a counterbalanced fashion. Each group utilised a set for each of the following conditions: pushed class, pushed email, and non-pushed class. In week 1, for instance, the first six words from each set were utilised, and so on.

Set 1 was applied to the pushed class condition, set 2 to the non-pushed class condition, and set 3 to the pushed email condition for Group 1. Set 1 was applied to the pushed email condition, set 2 to the pushed class condition, and set 3 to the non-pushed class condition in Group 2. Group 3 utilised set 1 for the non-pushed class, set 2 for pushed email, and set 3 for the pushed class.

Counterbalancing ensured that each condition was presented in an order which was randomly allocated across the groups, thereby eliminating any ordering effects. The three groups and three

sets of target vocabulary were utilised to compare traditional teaching methods, classroom learning with pushed output, and email learning with pushed output. The first 30 words comprised set 1, the second 30 words comprised set 2, and the final 30 words comprised set 3 (see Appendix 9).

In the first week of the experiment, the participants were briefed on the experiment's purpose and methodology (refer to sections 4.13.1 and 4.13.2). The selected book focuses on practical, high-frequency vocabulary to assist learners from novice to advanced levels in expanding their vocabularies. It consists of six series, each containing unique words that encompass a substantial portion of the vocabulary found in written and spoken texts.

This book utilises stories in the graded readers' style to allow students to learn vocabulary in a story format. Stories are considered an important part of learning a language (Perks and Lauritsen, 2016). Graded readers are books in which the language level is simplified (tailored to levels) to assist second language students learn words (Nation and Meara, 2010). Traditional books concentrating on vocabulary as a portion of the school curricula have tended to organise their units in agreement with themes (e.g., sports, cooking, cars), whereas this book centres units on stories. The chosen book uses graded readers, whereas more traditional teaching materials books avoid the story format (Perks and Lauritsen, 2016).

Therefore, the style of exercises in this research focuses on storytelling. One of the skills in producing language is writing something or speaking something, and thus storytelling is suitable because it encourages learners to produce many sentences. The pedagogical rationale for this approach is that asking students to use the target words in a story format makes the exercise more meaningful. Therefore, this book is highly suitable for my research.

During the treatment of the five weeks after the week of the pre-test, the teacher sent the six target words to each group of three groups using different techniques: pushed email, a pushed class and a non-pushed class. The students were asked to write each six target words in the format of a story. The treatment took place for four hours and 30 minutes per week over five weeks, with 90 minutes for the pushed class and 90 minutes for the non-pushed class. An activity was sent by email every Tuesday, and the students returned it to the teacher by email within seven days (but they were expected to complete it within 90 minutes). The deadlines were set for Monday at 12 pm in order for the teacher to give feedback within the day, although if any student emailed her answer before the deadline could obtain the feedback within the day.

Regarding written feedback, the teacher offered guidance to students on their use of the target words in a narrative writing activity (see appendices 13 and 14 for examples of teacher feedback). The instructions were clear, focusing on rectifying any incorrect word usage and improving orthography. The teacher aimed to provide feedback that would assist both in-class and remote learning students, potentially contributing to enhanced performance. By identifying their strengths and weaknesses through the feedback, students gained valuable insights, enabling them to address errors and enhance their understanding of the material. The constructive feedback they received on vocabulary and orthography likely played a key role in improving their writing abilities and overall outcomes. In addition, the feedback could result in improved performance by encouraging students to revise their work, implement the vocabulary in new contexts, and track their own progress over time.

Each group was exposed to three target word sets, each delivered using one of the three treatments. One target set delivered via an email-enhanced learning approach in the pushed output activity by sending an email containing six vocabulary items which the learners had to use to compose a story format and return by email. A second target set engaged in the pushed output activity in the classroom without email, with the students given six lexical items which they had to use in a story and hand in to the teacher. The third target set had no pushed class (i.e. the participants learned in class using traditional teaching approaches that did not offer feedback, encouragement or email). Each group was exposed to these three conditions (see Table 2).

With regard to the use of technology, the ease of use of email and its asynchronous nature gave the students time to reflect on what they were producing and identify any errors they might have made. The approaches for each group are shown in Table 2. The importance of having two conditions receiving pushed output (one in class and one by email-enhanced learning) was to identify whether email or the classroom activity leads to improvements in the students' vocabulary learning and retention. Moreover, the rationale behind using email as a messaging instant application rather than other applications (such WhatsApp) was that WhatsApp users are more likely to use emoticons than email users. As such, whilst WhatsApp may have benefits, in terms of a formalised vocabulary learning medium, it was felt that email would be a more appropriate medium to adopt for this study, despite the fact that email would not necessarily provide for 'real-responses' due to time lapses between the student sending their work and the teacher receiving it via email.

This study employed three intervention conditions to investigate the impact of pushed output on language learning outcomes. Before the experiment began and the participants were instructed to write, they had no prior exposure to the target words. The conditions were:

- **Pushed Email Condition:** This condition involved language instruction via email with a focus on pushed output. This activity required the learners to actively produce and use the target language in their responses, rather than passively observing it. In this study, all the participants experienced this condition at some point during the experiment, as the order of the conditions was counterbalanced across the groups. The pushed email condition consisted of an email activity every Tuesday, in which the learners had to compose a narrative using six key terms within 90 minutes. The deadline for submitting the narrative was set for Monday at 12 p.m., and the instructor provided feedback to the learners within seven days. If they submitted their story before the deadline, they could receive feedback the same day. In other words, there is no teacher input, and students were not expected to learn the meaning of the target words. The teacher only asked them to write the given six items in a story format, and the students had to complete it and return it to the teacher, who then provided feedback.
- **Pushed Class Condition:** This condition involved classroom-based language instruction with a focus on pushed output. This activity, as with the email condition, required the learners to actively produce and use the target language. In this study, all the participants experienced this condition at some point during the experiment, as the order of the conditions was counterbalanced across the groups. The pushed class condition consisted of a 90-minute class on Tuesdays, in which the learners composed a narrative using six target words and received immediate feedback from the instructor. For instance, when a student completed her activity of writing six items, she presented it to the teacher in class and received feedback on paper, and so forth for the remaining students. At the end of class, when all students had completed their work and received feedback, the teacher collected the papers once more, made copies of each, and gave the originals to the researcher while the students retained the copy. In other words, the teacher did not give any instructions during the 90 minutes, and the students had 90 minutes to complete this narrative (They could end early if they completed it). These 90 minutes were allocated to enable the students to write a narrative using the six selected items in a story format. Some students (all the participants in this study were at intermediate level) may have needed extra time to consider and construct their narratives.
- **Non-Pushed Output Class Condition:** This condition involved language instruction in a conventional classroom context without a focus on pushed output. This means students were not actively required to produce the target language and did not receive feedback on their performance. In this study, all the participants experienced this condition at some point during the experiment, as the order of the conditions was counterbalanced across the groups. The non-pushed output class condition consisted of learning the target vocabulary through traditional

teaching methods, such as writing the same six items in sentences for 90 minutes on Wednesdays. The instructor did not provide any feedback or encouragement. In other words, the instructor did nothing. The students were only given these six items to write six sentences.

The purpose of the study was to ascertain the influence of pushed output on language learning outcomes by randomly assigning participants to one of three conditions. This ensured that the results accurately reflected the effects of the various conditions on language learning and controlled for any potential ordering effects.

The rationale for designing the intervention (presented in Table 2) was that it ensured that there was a baseline of vocabulary knowledge assessed with the pre-test for all the groups, and that using the approach of immediate and delayed post-test supports identification of the short and long-term retention of the knowledge gained during the intervention. The rationale for using post-tests was to assess the participants' achievements between the three conditions, and the rationale behind a delayed post-test was to measure the retention of the participants' lexical knowledge. For this research, one outcome is that the vocabulary that is learned during the intervention might be retained because of the tests that the students wrote.

The pedagogical rationale for the approach was that asking students to use the target words in a story format makes the activity more meaningful. As Wong and Looi (2010) noted, providing meaning in EFL activities enhances not only engagement but also retention of vocabulary items in the longer term. In other words, as Craik and Lockhart (1972) claimed in their hypothesis of 'levels of processing', an item is more likely to be retained in the memory if a learner is more cognitively involved with it. Therefore, providing a meaningful activity and context in the email responses and pushed class could lead to improved outcomes for the students. Moreover, the rationale behind writing a story that is longer than two or three sentences is that doing this demands more thought and effort than writing a single sentence does. Thus, this result would support the pushed output hypothesis in terms of producing sentences, which is the theory the current study is testing.

4.8 Quantitative Data Analysis

The data gathered from the tests was coded and input into SPSS to enable identification and calculation of vocabulary knowledge in the groups (see SPSS outputs in Appendix 5), which could then be compared to the independent variable that consisted of three conditions (pushed class, pushed email and non-pushed email) and the dependent variable (gain scores). I created a variable entitled ID, which included student numbers. I then created variable named groups

- 1, 2 and 3. Next, I created a variable called ‘conditions’ with the values of pushed email, the pushed class and the non-pushed class. Following this, I created three variables called pre-tests, post-tests and delayed post-tests, and I included students’ achievements in each condition and period. Lastly, I created two variables – gain scores of the short period from pre-testing to post-testing and gain scores of the long period from pre-testing to delayed post-testing. I created these two variables by using computing variables.

This method allowed for graphical representations to be provided for demonstration of achievements and the overall testing outcomes. The questionnaire was quantitative with a 5-part Likert scale format from “strongly disagree” to “strongly agree” to specific statements regarding the benefits or otherwise of the teaching methods to which they had been exposed, and qualitative in asking the learners about their attitudes. The questionnaire, having collected numerical data to evaluate students’ perceptions, was also entered into SPSS so as to allow for similar statistical output analyses.

The overall analysis stages are as indicated below, based on guidelines from Treiman (2014) and Nardi (2018):

- a) Data screening: Assessment of basic descriptive data and frequencies to identify any items that are out of range or incorrectly coded
- b) Cronbach’s Alpha test to examine internal consistency and support reliability testing
- c) Normality tests to identify whether the sample is normally distributed
- d) Significance and correlation testing to identify linear relationships between the variables

These analysis processes and stages enhanced the validity and reliability of the work and allowed for clearer outcomes to be presented.

The first step was to code the data from the main study. The design was counterbalanced by controlling the order effects and word sets of each of the three conditions (pushed class, non-pushed class and pushed email) experienced by the three groups. Thus, there were nine orders in total. The data was then analysed according to the conditions.

The coding was carried out for a total of 90 words (due to 90 questions being asked in the VKS test and the productive test) for a total number of 54 students. The Likert scales of the questionnaire were coded in SPSS.

I then used a normality test, run in SPSS, to identify whether the sample was normally distributed. There are two normality tests – the Shapiro-Wilk test and the Kolmogorov-Smirnov test.

I used the Kolmogorov-Smirnov test because it is appropriate for a sample size over 50 (Mishra, et al. 2019), although the current study has 54 participants, which is greater than the sample size of 50. I did not use the Shapiro-Wilk test because it is used for sample sizes of 50 or fewer participants.

Overall, the p value of the Kolmogorov–Smirnov test was .000 for the pre-tests of the productive tests, for the gain scores from pre-testing to post-testing of productive tests, and for the questionnaires, and 0.003 for the gain scores from the pre-testing to the delayed post-testing of productive tests, demonstrating that the data did not have a normal distribution; therefore, a non-parametric test was used, based on Ghasemi's and Zahediasl's (2012) observation that a p value of more than 0.05 is considered normal distribution.

The Kruskal-Wallis one-way variance analysis, which is a non-parametric method, was used to determine if there were statistically significant differences in a dependent variable (pre-test) in order to identify the students' level before conducting the treatment. The Kruskal-Wallis test was considered a suitable statistical analysis regarding the goals of the current research, which were to evaluate whether there were differences in one dependent variable caused by an independent variable consisting of three or more groups. As Pallant (2010) stated, the Kruskal-Wallis test is the most suitable non-parametric method for comparing more than two groups; it requires one dependent variable and one independent variable consisting of three categories or more (Pallant, 2010). Therefore, the current research included one independent variable condition with three categories - pushed class, pushed email and non-pushed class - for conducting pre-test scores.

In order to answer the research questions, it was essential to use the Mann-Whitney U test. In accordance with Pallant (2010), the Mann-Whitney U test was chosen to apply non-parametric analysis in order to test the variations between two independent groups on a continuous measure. The current study looked first at two comparisons (i.e., pushed class versus non-pushed class and pushed email versus pushed class) in order to answer the first main research question and its sub-questions. Moreover, in terms of answering the second sub-question of the first main research question and test hypothesis three, the effect size comparison was applied and limited to three select groups, considering three conditions: pushed class, pushed email, and non-pushed class.

Effect size is measured because it is an essential result for any empirical research, allowing researchers determine whether an intervention has a large effect or no effect at all (Lakens,

2013). A p value alone does not illustrate effect size, so effect size measure is needed (A p value is designed to inform researchers if their findings are a fluke and not because they are a large sample size), and with a large sample size, any variation – no matter how small – can be statistically significant.

The effect size of this current study followed the calculation of the Mann-Whitney U test and used r^2 because it is a better option due to the fact that it describes the proportion of variance accounted for by a variable (Lakens, 2013), which is conceptually more straightforward than the correlation coefficient, and it is additive.

In the current study, after identifying a statistical benefit for both of the two comparisons (i.e., pushed class versus non-pushed class and pushed email versus pushed class), I measured whether the combination of pushed email and pushed class brings additional benefits.

In terms of analysing Section B of the questionnaire, I utilised a thematic analysis to analyse the open-ended survey. Thus, the current data was classified according to themes and then interpreted as codes, sub-codes, and patterns (Bryman, 2008). This could provide more knowledge about the phenomenon being examined (Braun & Clarke, 2006). Following this process, the theme of the participants' attitudes towards and experiences of using email to learn vocabulary emerged. The analysis of the data obtained from the open-ended questionnaire showed that the participants presented a number of codes which were done using pen and paper since the data of Section B of the questionnaire was limited. I created a mind map showing students' themes such as major themes and subthemes radiating out, reflecting the significance of using email in learning English vocabulary, the advantages of using email (such as improving learners' motivation, self-taught learning, and saving answers online). The difficulties the participants encountered concerned adapting to using email, such as technical difficulties and a lack of options concerning handwriting. The following section explains these findings in more detail.

4.9 Qualitative Data Analysis

4.9.1 Analysis of Students' Writings

The study adopted a quantitative analysis of vocabulary size, as one of the indicators of the students' writing quality and language proficiency. To measure the vocabulary size of the students, the study utilised the V_Words website created by Meara and Miralpeix (2016). The V_Words website is a frequency-based vocabulary size test that analyses brief plain text documents up to 8500 words in length. This word limit was ample for all students' scenarios, as they

were required to use six target words in a narrative structure or construct sentences that did not exceed 300 words. V_Words classifies as a word (type) any textual unit with a space on either side, including contractions. However, contractions are treated as single words unless their full forms are used (e.g., “she is” instead of “she’s” or “we would” instead of “we’d”).

The V_Words website was chosen for several reasons. First, it is a reliable and valid instrument that eliminates potential biases and inconsistencies in the measurement procedure (Meara & Miralpeix, 2016). A study was conducted by Meara and Miralpeix (2016) in order to determine the validity and reliability of the V_Words website. With the goal of making sure that the instrument measures the intended constructs properly and without incorporating bias, this required extensive testing and validation methods. Second, it is easy to administer and score, as it only requires the students to upload their texts online and receive instant feedback on their vocabulary size. Third, it is based on a meaningful definition of vocabulary size that reflects the number of different words known by a learner, rather than the total number of words used in a text (D’Anna et al., 1991). Fourth, it is supported by previous studies that have used the V_Words website or similar tests to investigate the link between vocabulary size and academic writing proficiency or other language skills (Milton & Treffers-Daller, 2013).

Therefore, the decision to use the V_Words website in the analysis of student writing was justified by its capacity to conduct a quantitative examination of vocabulary size, its appropriate word limit for the students’ scenarios, and its consistent word classification. This decision ensured that the study collected reliable and valid data, enabling meaningful insights into the language proficiency of the students (Meara & Miralpeix, 2016).

4.9.2 Analysis of lexical errors

In the field of language learning, lexical errors refer to errors or inaccuracies in the selection or form of words employed by language learners. These errors can occur at various levels, including individual lexical items and word combinations. Engber (1995) provides an exhaustive inventory of lexical errors, classifying them into two main categories: lexical choice and lexical form.

In my analysis of the students’ writing, I employed Engber’s (1995) inventory of lexical errors because it provides an exhaustive and systematic framework for identifying and categorising various categories and frequencies of lexical errors. The following paragraphs explain how the selection of Engber’s (1995) inventory relates to the research objectives and concerns.

Lexical Choice:

A. Individual lexical items: Errors associated with the selection of specific words fall under this category. Learners may select inappropriate or incorrect words to convey their intended meaning. Examples of lexical choice errors include using "big" instead of "large" or "happy" instead of "joyful" (Badilla and Nez, 2020).

B. Combinations: Lexical errors can also occur when students combine words incorrectly to create statements or sentences. Incorrect collocations or word order may be involved. Examples of lexical combination errors include saying "make a party" instead of "have a party" or "go to cinema" instead of "go to the cinema."

Lexical Form:

A. Derivational errors: This type of lexical error involves errors in the formation of words through derivational processes, such as the addition of prefixes and suffixes. Learners may incorrectly attach affixes or misuse them, resulting in nonexistent words or words with a different meaning. For example, in this line, saying "confliction" rather than "conflicts" would be regarded as a derivational error. Many conflicts exist between these two nations (Enger, 1995).

B. Verb forms: Incorrect verb usage may also constitute a lexical error. This includes verb tense, aspect, and agreement errors. For example, saying "I goed to the store" instead of "I went to the store" or "He don't like ice cream" instead of "He doesn't like ice cream" would be considered verb form errors (Kusumawardhani, 2018).

C. Major spelling errors: This category refers to errors in word spelling that can lead to misspelt or distorted words. These errors can have a substantial impact on the legibility and comprehension of written texts. For instance, the misspellings "beautiful" as "beutiful" or "restaurant" as "resturant" would be regarded as significant (Engber, 1995; Fernández, 1997; Bouvy, 2000; Agustn-Llach, 2017).

The exhaustive categorisation of lexical errors provided by Engber's taxonomy enables a thorough analysis of the prevalent categories of errors made by language learners. It enables a clear comprehension of the areas requiring improvement. In addition, the practical implementation of Engber's taxonomy includes classroom instruction, language assessment, and error analysis (Engber, 1995). By utilising this taxonomy, teachers are able to identify the specific areas of vulnerability for each student and tailor their instruction accordingly. In addition to informing pedagogical approaches and strategies for teaching vocabulary, Engber's taxonomy helps instructors devise instructional materials and activities that target specific areas of difficulty.

According to Engber (1995), lexical errors are more detrimental to the quality of writing than grammatical errors, and L1-influenced errors are more severe than L2-influenced ones.

Numerous researchers have utilised Engber's taxonomy 1995 to investigate the relationship between lexical errors and the oral or written performance quality of ESL students. For example, Lu (2010) used a computational system to measure three dimensions of lexical richness - lexical density, sophistication, and variation - and examined their correlation with raters' evaluations of ESL learners' oral narratives. Lu discovered that Engber's taxonomy from 1995 was useful for identifying the most problematic areas of vocabulary use and for providing instruction recommendations based on both his own study and Zarei's (2013) results.

Zarei (2013) investigated the lexical errors and their categories in the compositions of Iranian EFL students, in addition to their correlation with writing quality score. He discovered that Engber's taxonomy 1995 was a reliable tool for assessing lexical errors and their impact on writing quality. The writing quality score was calculated through assessing the compositions of Iranian EFL students by a number of raters. The evaluators used a score system that took into account many aspects of writing excellence, such as the existence of lexical mistakes. These lexical problems were identified and classified using Engber's taxonomy (1995).

4.9.3. ChatGPT for lexical errors, word selection, and ratings

I used Engber's (1995) classification of lexical errors to conclude the qualitative analysis of the students' writings. After identifying the lexical errors, I enlisted the assistance of two PhD-holding native speakers to assess them. In addition, I used ChatGPT to generate alternative terms for the target words and evaluate their applicability on a scale from 1 to 5, with 5 representing the most appropriate alternative (see Appendix 16).

ChatGPT can provide definitions, translations, examples, synonyms, antonyms, and collocations for a variety of terms in multiple languages (Cointelegraph, 2021; Jiao et al., 2023), making it a useful tool for locating alternative words or rating target words. While Engber's taxonomy provides a framework for identifying lexical errors, it does not provide specific alternatives or ratings for their appropriateness. Consequently, Engber's taxonomy does not explicitly support the use of ChatGPT to suggest alternative terms and provide ratings. Nevertheless, this technique can be a useful instrument for refining and improving lexical choices.

Kohnke, Moorhouse, and Zou's (2023) review of ChatGPT as a technology for language teaching and learning highlighted its potential by providing examples of learning tasks for teachers

and students who were new to ChatGPT. In addition, it has addressed ChatGPT-related controversies and disadvantages and proposed solutions for overcoming them. Recognising that AI-powered digital tools are here to stay, language instructors and students require advanced digital skills to effectively utilise these tools while navigating their risks and disadvantages.

ChatGPT emerges in this context as a versatile and valuable tool with the potential to enhance language learning in an engaging and adaptable manner. Kohnke, Moorhouse, and Zou (2023) urge language instructors to investigate its pedagogical potential and to implement it in education in a theoretically sound and principled manner.

It is crucial to guarantee the accuracy and dependability of ChatGPT's suggested alternatives. It is essential to involve native speakers with doctoral degrees in the evaluation process, as their expertise and linguistic knowledge can provide valuable insights and aid in identifying appropriate alternative terms. In addition, it is necessary to evaluate critically the appropriateness of alternative words in the given context. The appropriateness of the alternatives must be thoroughly evaluated to ensure that they correspond to the text's intended meaning and style.

Using a combination of Engber's taxonomy, the knowledge of native speakers, and ChatGPT, the analysis aims to improve the accuracy and appropriateness of lexical choices and the overall quality of texts.

4.10 Questionnaire

The goal and aim of this questionnaire was to assist the investigator to gather information from the participants (Bryman, 2012). The questionnaire was designed so as to explore students' experiences of and attitudes towards studying vocabulary using email as part of a technology-enhanced learning approach to learn vocabulary.

The questionnaire has two sections. Section A consists of Likert scales analysed quantitatively, with a 5-point Likert scale format from 'strongly disagree' to 'strongly agree' measuring the extent to which the students agreed with specific statements regarding the benefits or otherwise of the teaching methods to which the participants were exposed. There are three main points: their experiences and attitudes towards learning vocabulary, using email, and later combining learning vocabulary with using email. This section was analysed using SPSS.

Section B is qualitative with respect to asking about the learners' attitudes using open-ended questions, such as questions on how the participants felt about email, questions on the advantages and disadvantages of using email to learn vocabulary and questions on why using email helped the students to learn words.

The instructions of the questionnaire were written in Arabic for the convenience of the participants. Sections 1 and 2 were written in English. The participants were allowed to choose whether to answer the questionnaire in English or Arabic because the aim of this questionnaire was to explore the experiences and attitudes of the participants, not to examine their English language proficiency, and some of the students could explain their experiences more easily in their mother tongue.

4.11 Reliability and Validity

Reliability and validity are essential measurements of the quality of any research, including education. This subsection reports on how these two measurements of quality were maximised in the current research

4.11.1 Reliability

Joppe (2000) stated that the extent to which findings are consistent over time and constitute a precise representation of the entire population under study is referred to as reliability; he added that if the findings of a study can be reproduced using an identical methodology, then the study results can be considered reliable.

In accordance with standard practices for conducting reliable research, the overall methodology is presented here. The way in which the quantitative approach was organised with respect to answering the research questions is shown in tables and diagrams (see Chapter 5). In addition, the design development of the quasi-experiment planned for the current research shows that other investigators would be able to repeat the study utilising the same methodology.

In relation to the data, detailed analyses are available for scrutiny. All the data from the current research were coded by the investigator and reviewed by academic colleagues to avoid miscoding. One of these academic colleagues is a PhD student who has a keen interest in mathematics and who exported the statistics into SPSS. Another colleague, an assistant professor at Um Alqura University in Saudi Arabia, is highly experienced with SPSS. This rendered the process of the quantitative method, the design of the quasi-experiment, and even the data more retrievable and replicable (Bryman, 2012) at any time for examination by the reader.

To ensure the accuracy of the qualitative data and analysis, the present study employed a number of procedures. The questionnaire was piloted with a small sample of learners to determine its lucidity, reliability, and practicability. Before administering them to the primary sample, any issues or problems were resolved. Second, the questionnaire and lexical error analysis were coded by the researcher and reviewed by two academic native English speakers to prevent miscoding or misinterpretation of students' lexical errors in their writings. Third, qualitative and quantitative data were triangulated to provide a comprehensive and consistent response to the research query.

4.12 Validity

Validity comes in two forms – internal and external – and is an important criterion for assessing the acceptability and quality of any study. It concerns the safety of the inferences that are created from the research (Bryman, 2012). The current research utilised a mixed methods approach, enabling what was measured statistically to be further explored in qualitative consideration of the participants' opinions and attitudes. Overall, the procedures presented in the next subsection demonstrated that the tools and data met two validities.

4.12.1 Internal validity

One form of validity is *internal validity*, refers to whether a conclusion based on an occasional relationship between two or more variables appears to hold true (Bryman, 2012). In other words, it illustrates the extent to which any variations found in the dependent variables are directly related to the independent variables (Mackey & Gass, 2005). Slack and Draugalis (2001) stated that internal validity is an essential aspect of any research which explores cause-and-effect relationships. Mackey and Gass (2005) argued that an investigator should control for all the possible factors that could potentially account for the findings and eliminate any potential threats to the internal validity of the research.

In the current research, some attempts were made to control for extraneous variables and important variables that could otherwise have affected the findings. For instance, the participants' English vocabulary levels of the given words were controlled in all three conditions in the pre-tests of the productive test and VKS; thus none of the differences in the research findings could be attributed to differences between the participants in terms of their baseline English vocabulary levels. Moreover, treatment fidelity, which is explained in Section 4.10.3, improved internal validity by ensuring that training was conducted in a similar way for all participants.

4.12.2 External validity

The second form of validity is external, which questions if research findings are generalisable. While the quasi-experiment design of the current research is used in natural environments, the main results are applicable to other settings, enabling generalisations to be made about other populations. As there were 54 participants in the current research, the sample was deemed to have supported external validity. In addition, treatment fidelity is related to external validity by ensuring that results can be generalised (other teachers may use the checklist).

One aspect of external validity is ecological validity. Bryman (2012) stated that ecological validity illustrates the degree to which sociable scientific results apply to the real everyday settings of social action that people naturally engage in. In experiments where an investigator investigates how to teach and learn languages in a psychology lab, for instance, it could be argued that the study does not have ecological validity, since the investigator must test a place where teaching and learning in fact occurs (e.g. a classroom) to see how students really learn languages. This setting enhanced the credibility of the study, thus boosting its ecological validity.

4.12.3 Treatment fidelity

After piloting, the researcher decided to use the treatment fidelity in the form of the teacher self-evaluation checklist form (see Appendix 3) to ensure that all the instructions were delivered appropriately. Borrelli (2011) stated that assertions about the effects of treatment can not be tested without observing treatment fidelity. In other words, without treatment fidelity, important findings may be a function of either an efficient intervention or the effect of another unknown factor omitted from or added to the intervention.

This checklist was ticked after the data collection, although the researcher gave the teacher the form before the pre-test but asked her to tick it after the data collection. The checklist has four sections. First, the beginning of the treatment looks at whether the teacher has told the students about the purpose of the study and given them the information sheet and informed consent form. The teacher must also have administered the pre-test in the first week of the treatment, derived from the VKS and productive tests for the three groups.

Secondly, the list asks the teacher whether she had emailed the students the six target words every week from the second week until the sixth week of the treatment regarding email with pushed output; whether she had emailed the students six target words every week from the second week until the sixth week of the treatment regarding pushed output in class; and whether she had provided the students with the six target words every week from the second week until

the sixth week of the treatment concerning non-email and non-pushed output. It also asks the teacher whether she had received the students' answers concerning pushed output in the class and email with pushed output and, finally, whether she had provided students with feedback.

Thirdly, the list asks the teacher whether she had asked the students to write a story format using the given words on a weekly basis and whether the time taken to complete the exercises in class occurred for three hours every week in terms of pushed output and non-pushed output.

This email pertains to a computer-administered exercise that students were anticipated to complete. The exercise entailed composing short stories using six words emailed to the students every Tuesday. The students had seven days to complete the assignment, but they were expected to complete it within 90 minutes. They had the flexibility to choose any time within 24/7 to complete the exercise. The submission deadline was Monday at 12 p.m., and students who submitted their work before the deadline received immediate feedback. Over the course of five weeks, there was a total of four hours and 30 minutes of activity per week, divided as follows: 90 minutes for the pushed class, 90 minutes for the non-pushed class, and 90 minutes for the pushed email activity.

Finally, the list asks the teacher whether she had administered the post-test to the students at the end of the treatment, at the beginning of the seventh week (i.e. after five weeks of treatment). Moreover, it verifies that the teacher did not provide the students with exercises using the same words from the 7th week until the beginning of the 11th week. Finally, it asks the teacher whether she had provided the students with a delayed post-test at the end of the 11th week, then asked the students to fill out the questionnaire. (The treatment fidelity form can be found in Appendix 3).

4.13 Ethical Issues

Regarding ethical approval, all research that involves human participants necessitates a commitment to ethical guidelines. I provided the respondents with a consent form, information sheet and treatment fidelity in the first week prior to the treatment, as explained in sections 4.10.1, 4.10.2 and 4.10.3. As a final note in this chapter, the process of data gathering took place over 12 weeks, starting from the beginning of September, after ethical clearance for the research had been obtained from the Research Ethics Committee and the ECLS administration.

4.13.1 Information sheet

The participants were required to answer a concise questionnaire that was prepared to elicit personal information, such as the name of the researcher, the university where I am studying,

the names of my supervisors and the purpose of the study. Moreover, the questionnaire was designed to determine whether the student's level was an intermediate student at Albaha University. They agreed to complete some short exercises in the three conditions every week for five weeks and to complete a pre-test, a post-test and a delayed post-test and complete a questionnaire. They were informed that participation in the study would take approximately three hours per week (90 minutes for the pushed class and 90 minutes for the non-pushed class) during their usual English lessons. They were also advised that they would be emailed an activity every Tuesday, which should be returned by email within seven days. The deadline would be the following Monday at 12pm to give the teacher time to prepare and send feedback on the same day although any student who emailed an answer before the deadline would receive feedback within the day.

The information sheet provided the participants with information about the activities they would be asked to complete - a pre-test, a writing activity in the form of a story in the three conditions, a post-test, a delayed post-test and a questionnaire - and the estimated amount of time needed to complete these activities. The students were advised that there were no risks related to the study. Nonetheless, they were also informed that they would be able to withdraw from the research at any time if they felt displeasure for any reason and they would be able to demand that their answers are removed from the study.

The full information sheet can be found in Appendix 1. This information was essential to control and statistically test the important effects related to the participants' variables on the result of the experience.

4.13.2 The consent form

Cohen et al. (2007) and Denscombe (2014) both stated that the act of gathering data is usually thought of as an intrusion into the lives of the participants; therefore, the participants were initially provided with an informed consent form to read. The consent form gave details about the goal of the current research in comparing the effects of three different types of vocabulary learning activities on the vocabulary learning of adult Saudi EFL learners and to help learners and teachers to grasp the effects of email on the process of learning and teaching.

The participants were assured that all their data and answers would be protected to secure anonymity and confidentiality. Once the participants had agreed to participate in the research, they were asked to sign and date the consent form. All the participants were adults over the age of

18; therefore, they did not need permission from their parents or legal representatives. (A version of the consent form can be found in Appendix 2).

The participants were provided with the email address and mobile phone number of the investigator in case they had any questions related to the research or the research procedures. The participants were also provided with the email address of the School of Education, Communication & Language Sciences Ethics Committee in case they had any concerns about the research.

4.14 Piloting

A pilot study for the project was conducted between 14 January 2019 and 7 February 2019, to assess the study's viability and help me determine how to work out the proceedings of the main data gathering and examine any aspects that might have to be changed. It also assisted in creating new and essential ideas with respect to the data gathering instruments. The benefits of performing the pilot could be observed after analysing the data it generated, revealing how efficient the instruments were.

Initially, the research included three student groups. Seventy Saudi adult EFL students were recruited from three third-year English specialisation courses at Albaha University. It used a between-subjects design so that each group was exposed to each of the three treatment types using a different word set (see Table 4). This approach helped control the effects of sequencing both treatments and word sets.

Table 4: Group Set-up and Order of Word Sets

	Word Set 1	Word Set 2	Word Set 3
Group 1	Pushed Class	Non- pushed class	Pushed email
Group 2	Pushed email	Pushed Class	Non- pushed class
Group 3	Non- pushed class	Pushed email	Pushed Class

There were 45 lexical target words in the pilot study (15 each week). The instructional treatment took place for three hours per week over three weeks. In the first week of the experiment, the learners had an induction regarding the experiment. Both pre- and post-tests were performed. These tests used the VKS task (Wesche and Paribakht, 1996) for receptive knowledge, involving a 4-point scale which allowed the learners to show their level of knowledge of vocabulary, and a test of productive knowledge devised by Laufer and Nation (1999), focused on controlled production as a measure of productive vocabulary through the adoption of completion items. The lexical items in both tests were selected by the researcher from the book '4000 essential English words' (Nation, 2009).

As seen in Table 4, each group was exposed to three sets of words using a different treatment for each group. For the email-enhanced learning approach in a pushed output activity, the students received an email containing five vocabulary items which they should use to compose a story and returned by email, after which they would receive teacher feedback. The second treatment was a pushed class; here, the students were given five lexical items which they should use in a story. This story should be emailed to the teacher, after which feedback would be given. The third treatment included a non-pushed class (a class that did not offer feedback and encouragement). Quantitative data was collected with a 4-part Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’ with specific statements regarding their attitudes. The qualitative data was collected by asking a number of open-ended questions. Other tests, such as the VKS and productive tests, were analysed by SPSS.

The questionnaire was quantitative with a 4-part Likert scale format from ‘strongly agree’ to ‘strongly disagree’ with specific statements regarding the benefits or otherwise of the teaching methods to which participants had been exposed. The questionnaire was qualitative with respect to asking about the learners’ attitudes using open-ended questions, such as questions on how the participants feel about email and the advantages and disadvantages of using email to learn vocabulary and questions on the reasons the email helps students learn words.

A Cronbach’s alpha was used to determine the questionnaire’s reliability. This indicated a score of 0.709, a good level of reliability according to Cronbach. In addition, the questionnaire's validity was assessed by my consulting assistant professors at Albaha University (see Table 5).

Table 5: Reliability Statistics

Cronbach's Alpha	N of Items
.709	13

The data gathered from the tests was coded and input into SPSS to enable identification and calculation of vocabulary knowledge in the groups, which then compared for improvement during the intervention period and at the two testing stages. This approach allowed for graphical representations to be provided for demonstration of achievements and overall testing outcomes. The questionnaire, having collected numerical data to evaluate the students’ perceptions, was entered into SPSS to allow for similar statistical output analyses.

The first step was to code the data from the pilot. The design was counterbalanced by controlling the order effects and word sets of each of the three conditions (pushed class, non-pushed

class and pushed technology) experienced by the three groups. Thus, there were nine orders in total. The data was then analysed according to groups.

The coding was carried out from a possible total of 45 words (due to 45 questions being asked in the pilot VKS test and also in the productive test) and for a total number of 70 students. The Likert scales of the questionnaire were coded as well in SPSS.

I used the test of normality by SPSS and it was found to be normally distributed. Hence, the study used parametric statistics, and the one-way analysis of variance (ANOVA) was used to compare the means of the three conditions. ANOVA was chosen over a t-test because the study included three groups; as Kim (2014) noted, ANOVA is the most suitable method for comparing more than two groups.

I conducted a small-scale pilot investigation of the tokens and testing instrument. For this pilot, I chose 45 words to be used with various groups different to those used in the primary study over the period of three weeks. The objective of the pilot was to assess the feasibility of the study and determine the optimal strategy for the primary data collection. The pilot study helped identify any problems that required resolution.

During the pilot, some matters and difficulties were raised during the pilot. First, the students had difficulty understanding the VKS test choices. Thus, I selected the same vocabulary items as those of the authors (Wesche & Paribakht, 1996). Second, there was a requirement to determine the treatment fidelity (i.e. checklists for teachers to ensure that they were delivering consistent guidelines according to the procedure explained by the researcher) because, in the first week, a small number of students wrote five target words in the list of sentences without a story format. I then asked the teacher to check every student in the second and third weeks with respect to writing in a story format. I wrote the instructions for the question to write a story format in the Arabic language. Thereafter, the students began to write a format story in the second and third weeks of the treatment. Hence, it was essential to provide checklists for the teacher. Third, we imposed a requirement to redo the questionnaires to separate the questions into three sections: about learning vocabulary, about email and about combining the vocabulary with email. Each section included positive and negative statements. Fourth, I changed 1 to the lowest score and 5 to the highest score for the Likert scale in the questionnaire. I added a neutral option because Johns (2005) stated that the neutral response option authorises students who are neutral with respect to a subject to choose neutral instead of forcing them to select an answer that does not correspond to their true beliefs.

4.15 Conclusion

This chapter has provided details about the study's research questions, information about the participants, and information about the study design, including a comparison of the three conditions in terms of the instruction received by each group (summarised in Table 2). Further information was given about the study's dependent and independent variables.

This chapter has discussed how the study will apply a mixed methods approach to compare the selected three conditions. First, quantitative data (test marks and Likert-scale questionnaires) will be generated to assess the participants' achievements in learning the lexical items in the three conditions. Information was provided about the data collection procedures. The chapter has also discussed how SPSS will be used to analyse variance and determine statistical differences. In addition to the statistical analysis of variance, the chapter explained how lexical errors in writing samples would be analysed and the size of the vocabulary. The lexical errors will be identified and categorised in accordance with Engber's (1995) taxonomy, which distinguishes four categories of errors. The analysis of lexical errors will aid in determining the effect of the three conditions (pushed class, pushed email, and non-pushed class) on the lexical accuracy of the participants. The vocabulary size will be Meara and Miralpeix's (2016) V_Words website. Finally, thematic analysis will be conducted on a set of qualitative data (section B of the questionnaire) which asks the students about their attitudes towards and experiences of using email for learning English vocabulary.

The chapter also discussed the quasi-experimental design based on a pre-test, a post-test, and a delayed post-test with a counterbalanced design. Following past studies, the research implements a design whereby three conditions are utilised in such a way as to ascertain the intervention impact. Ethical considerations were also presented, before the chapter concluded with a discussion of how the current study was piloted. An analysis of the results can be found in the next chapter.

Chapter 5. Results

5.0 Introduction

This chapter divides the results of the study into four sections, namely a productive test analysis, a vocabulary knowledge test analysis, a questionnaire analysis and a qualitative analysis that links the questionnaire results to the test scores as well as an analysis of lexical errors in writing samples and the size of the vocabulary. The first section presents the findings of the productive test analysis for the pre-test, the post-test and the delayed post-test, the gain scores of pre-testing to post-testing and the gain scores of pre-testing to delayed post-testing, followed by an analysis of the effect size (see Chapter 4 for more information about gain scores). The second section of this chapter looks at the findings of VKS test analysis for the pre-test, the post-test and the delayed post-test, the gain scores of pre-testing to post-testing and the gain scores of pre-testing to delayed post-testing, followed by an analysis of the effect size. The third section examines an analysis of lexical errors and the size of the vocabulary in writing samples, where lexical errors are identified and categorised according to Engber's (1995) taxonomy, which distinguishes categories of errors, and the vocabulary size is determined using the V_Words website created by Meara and Miralpeix (2016). The fourth section examines the reliability of the questionnaire and analyses the scales regarding the participants' attitudes and experiences towards email in the first section of the questionnaire, before analysing section B of the questionnaire qualitatively. The fifth section looks at the benefits of using email and the sixth section discusses difficulties experienced by the participants in adapting to the use of email. The seventh section examines the relationship between the questionnaire data (i.e. Section A of the Likert scales and Section B of the open-ended questions) and the experimental data (i.e. the test scores for the productive and vocabulary knowledge scales).

5.1 Productive Test Analysis and Results

5.1.1 Data analysis of the productive test

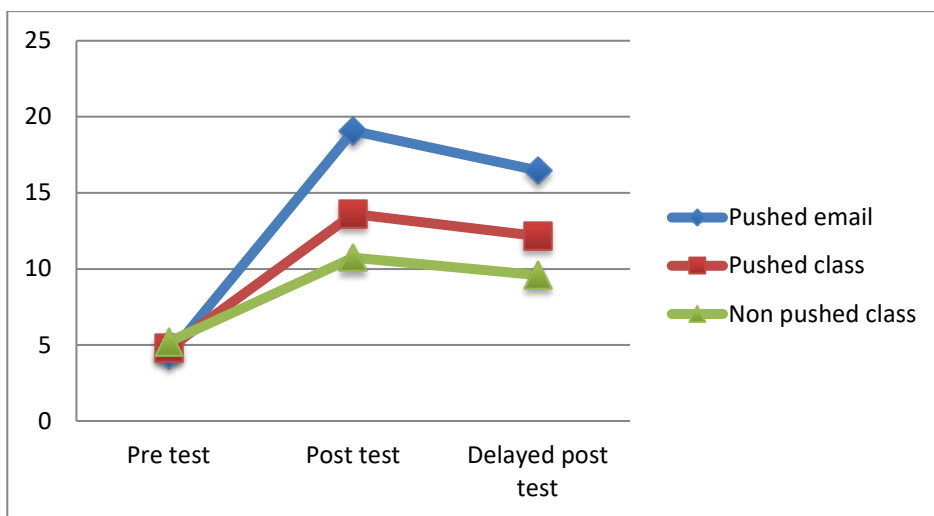
The main analysis focused on the productive tests in all three conditions (pushed class, pushed email, and non-pushed email), which were administered before, immediately after, and five weeks after the intervention. Figure 3 shows the mean scores for each condition at each time point.

Using SPSS, the independent variable (the three conditions) was used to predict to the dependent variable (gain scores) in order to determine their relationship. An "ID" variable was created for student identifiers, and a "groups" variable was created with the values 1, 2, and 3. The variables pushed email, pushed class, and non-pushed class were assigned to the "conditions"

variable. For each student, three additional variables were created to represent the number of correct answers out of 30 on the pre-tests, post-tests, and delayed post-tests. The utmost achievable score on each examination was 90. In order to eradicate ordering effects, the target words were separated into three groups of 30 words and presented in counterbalanced conditions (pushed class, pushed email, and non-pushed class). The first 30 words comprised set 1, the second 30 words comprised set 2, and the last 30 words comprised set 3 (see Appendix 9). These sets were counterbalanced across conditions so that each set appeared an equal number of times in each condition.

The descriptive statistics in Figure 3 reveal that the mean scores on the pre-test were low across all three conditions (4.33, 4.76, and 5.2 out of 30), indicating a lack of familiarity with the lexical items used in the productive test. There were no statistically significant differences between the conditions. The post-test scores were higher than the pre-test scores, and even though the delayed post-test scores decreased, they still demonstrated significant improvement on the pre-tests scores.

Figure 3: Pre-test, post-test and delayed test result for the productive tests



Again, as seen in Figure 3, the post-test scores improved for all three conditions, and the improvement appeared greater for the pushed email condition than it did for the improvement in the pushed class and non-pushed class conditions. This indicates that the students learned more in the pushed email condition. In terms of the delayed post-tests, the scores decreased, but still improved on the pre-test scores, and this improvement was apparent in the pushed email condition rather than in the other two conditions.

I used the Kruskal–Wallis test for the three conditions in order to determine if there was a significant difference across the three conditions. This test was used because it is the main non-

parametric test that compares three independent variables; the purpose of the pre-tests was to determine the students' levels before starting the treatment (the reason for choosing this particular test are explained in Chapter 4, Section 4.8). This analysis was between conditions; thus, different students experienced the three conditions in a different order (see Chapter 4, Section 4.7).

The Kruskal–Wallis test outcomes revealed that there were no significant differences amongst the pre-test scores for the three conditions, namely the pushed class, the pushed email and the non-pushed class, (Kruskal–Wallis = 3.397, $P = .183$, $df = 2$), illustrating that the p value for the three conditions was not less than 0.05.

Table 6: Comparison of Three Conditions on Productive Test Performance by Students

Conditions	Pre-test	Post-Test	Delayed test	Gain scores from pretesting to post testing	Gain scores from pretesting to delayed post testing
Non - Pushed Class	5.2	10.74	9.59	5.50	4.39
Pushed class	4.76	13.61	12.15	8.80	7.44
Pushed Email	4.33	19.07	16.48	14.74	12.13

The objective of this study was to investigate the influence of three distinct instructional strategies on student performance. There are five columns in the table, designated Conditions, Pre-test, Post-test, Delayed post-test, Gain scores from pre-test to post-test, and Gain scores from pre-test to delayed post-test. Each column in the table relates to a unique instructional strategy: Non-Pushed Class, Pushed Class, and Pushed Email.

The Pre-test column shows the mean scores of each student before any intervention-based assessment. The Post-Test column shows the students' average test scores after the implementation of the instructional strategies. The column labelled Delayed post-test shows the mean scores of students who were evaluated at a later date. The last two columns - Gain scores from pre-testing to post-testing and Gain scores from pre-testing to delayed post-testing - illustrate the improvement in student performance as determined by comparing test scores.

According to Table 6, the pre-test, post-test, and delayed post-test scores of students improved according to all three instructional approaches. It is crucial to observe, however, that students

in the Pushed Email condition scored better on both examinations than students in other categories.

Table 6 indicates that the implementation of a Pushed Email teaching method could result in enhanced student performance. In the following sections, additional investigation and analysis statistics are described in greater detail.

5.1.2 Effect of condition on productive test word learning in the short term

This section analyses the effect of the conditions on the word learning from the productive test in the short term, i.e. from pre-testing to post-testing. To compare the gain scores of the pushed class versus the non-pushed class and pushed email versus the pushed class and to conduct a statistical analysis, the gains in scores resulting from the procedure were calculated. The groups were compared in this way due to the 2x2 design, which investigates both pushed and non-pushed classes (comparison one) and the pushed class versus pushed email (comparison two). This analysis compared the gains in scores from the pre-test to the post-test for the productive tests relating to the two comparisons (see Table 7 and Table 8).

The first comparison began with the gain scores from the pre-testing to the post-testing of the productive test between the pushed class and non-pushed class, and the Mann-Whitney U test, the main non-parametric test for comparing two independent variables, was applied to identify whether there was a level of significance between two independent variables (pushed class and non-pushed class). The results of the Mann-Whitney U test are presented in Table 7, indicating a significant difference between the pushed class condition and the non-pushed class condition, with a p value of less than 0.05.

In order to determine which condition was higher, the standard deviations and the minimum, maximum and mean gain scores from the pre-tests to the post-tests are given in Table 7. As this table shows, the p value was .000, which indicates a significant difference between the pushed class and the non-pushed class. The pushed class conditions were higher, with a mean score of 8.8 and a standard deviation of 3.55, compared to the non-pushed class condition in which the mean was 5.5 and the standard deviation was 2.72. In terms of the minimum and the maximum values, the maximum for the pushed class condition was 15 compared to nine for the non-pushed class condition. Thus, the pushed class condition had higher gain scores than the non-pushed class condition.

Table 7: Comparison of the productive test score gains from pre-testing to post-testing (pushed class versus non-pushed class)

Conditions	N	Mean	SD	Minimum	Maximum	Mann-Whitney U	Z	p
Pushed class	54	8.80	3.55	1	15	720.00	-4.56	.000
Non-pushed class	54	5.50	2.72	0	9			
Total	108							

In terms of the second comparison between pushed email and pushed class, the Mann-Whitney U test was used to analyse the scores from the pre-test to the post-test period for the productive test and to determine if there was a significant difference between them (see Table 8). Table 8 reveals a significant difference between the pushed email condition and the pushed class condition, with a p value of less than 0.05.

To determine which condition was higher, SPSS was used to find the standard deviation, and the minimum, maximum and mean gain scores from the pre-test to the post-test (see Table 8). Table 8 shows a significant difference between the pushed email and the pushed class, with a p value of .000. The pushed email condition scores were higher, with a mean score of 14.74 and a standard deviation of 5.49, compared to a mean score of 8.80 and a standard deviation of 3.55 for the pushed class condition. With regard to the minimum and maximum values, the maximum value for the pushed email condition was 26, compared to 15 for the pushed class condition. Thus, the pushed email condition had higher gain scores than the pushed class condition.

Table 8: Comparison of the productive test score gains from pre-testing to post-testing (pushed email versus pushed class)

Conditions	N	Mean	SD	Minimum	Maximum	Mann-Whitney U	Z	p
Pushed email	54	14.74	5.49	6	26	589.00	-5.35	.000
Pushed class	54	8.80	3.55	1	15			
Total	108							

In terms of effect size, a statistical benefit was identified for both comparisons (pushed class versus non-pushed class and pushed email versus pushed class – see Tables 7 and 8) in line with hypothesis 3. In addition, whether the combination of email and pushed output had a further benefit over and above the same method within the classroom was investigated. After the two comparisons above confirmed the hypotheses 1 and 2, the effect size was used to determine whether the size effect of pushed email was greater than expected compared to that of the pushed class, answering the second sub question of the first research question.

According to Table 7, the Mann-Whitney U test revealed a significant difference in the gain

scores in the pre-testing to post-testing with the pushed class ($M = 8.8$, $n = 54$) and the non-pushed class ($M = 5.5$, $n = 54$); the value of z was -4.56 , with a p value of $.000$, and the value of r^2 was $.19$, meaning that the effect size was $.19$ which, according to Cohen (1988), indicates a medium level of effect.

According to Table 8, the Mann-Whitney U test revealed a significant difference in the gain scores in the pre-testing to post-testing of the pushed email ($M = 14.74$, $n = 54$) and the pushed class ($M = 8.8$, $n = 54$); the z value was -5.35 with a significant p value of $.000$, and the value of r^2 was $.26$. Thus, the effect size was $.26$; according to Cohen (1988), this effect size is a large effect.

The finding regarding the effect size provided support for the effect of completing exercises via email, as the effect of the pushed output was greater than that of pushed output within the classroom. This referred gain scores from pre-testing to post-testing for the productive test.

5.1.3 Effect of condition on productive test word learning in the long term

This section analyses the effect of the pushed email, pushed class and non-pushed class conditions on productive test word learning in the long term, i.e. from pre-testing to delayed post-testing. In order to answer the research questions and test the hypotheses in the long term, a statistical analysis of the gain scores from pre-testing to delayed post-testing of the pushed class was conducted vis-a-vis the non-pushed class and pushed email versus the pushed class. This analysis compared the gains in scores for the productive test (see Tables 9 and 10).

For the first comparison, the Mann-Whitney U test was applied (see Table 9) in order to juxtapose the two independent variables (pushed class and non-pushed class) to determine if there is a significant difference between them. As shown in Table 9, a Mann-Whitney U test revealed a significant difference between the pushed class condition and the non-pushed class condition, with $p < 0.05$.

To see which condition obtained a higher score, SPSS was used to find the standard deviation, minimum, maximum and mean gain scores from the pre-tests to the delayed post-tests (see Table 9). Table 9 shows that the p value was $.000$, indicating a significant difference between the pushed class and the non-pushed class. The pushed class condition obtained a high score with a mean score of 7.44 and a standard deviation of 3.48 in comparison to the non-pushed class condition's mean of 4.39 and a standard deviation of 2.99 . With regard to the minimum and maximum values, the maximum value for the pushed class condition was 14 compared to

10 for the non-pushed class; thus, the pushed class condition obtained a higher gain score than the non-pushed class condition.

Table 9: Comparison of the productive test score gains from pre-testing to delayed post-testing (pushed class versus non-pushed class)

Conditions	N	Mean	SD	Minimum	Maximum	Mann-Whitney U	Z	p
Pushed class	54	7.44	3.48	0	14	741.00	-4.44	.000
Non-pushed class	54	4.39	2.99	-1	10			
Total	108							

In the second comparison, the Mann-Whitney U test was used to analyse the gain scores from the pre-test to the delayed post-test periods for the productive test between pushed email and pushed class for conducting and responding to determine if there were any differences between them (see Table 10). The Mann-Whitney U test revealed a significance difference between the pushed email condition and the pushed class condition, with a *p* value less than 0.05 (see Table 10).

SPSS was used to determine the standard deviation, minimum, maximum and mean gain scores from the pre-test to the delayed post-test (see Table 10). Table 10 shows a significant difference between the pushed email and the pushed class, with a *p* value of .000, while the pushed email condition obtained a high mean for the gain score, at 12.13, and a standard deviation of 5.01, compared to a mean gain score and a standard deviation for the pushed class condition of 7.44 and 3.48, respectively. Moreover, the maximum value for the pushed email condition was 22, compared to 14 for the pushed class condition; thus, the pushed email condition obtained a higher gain score than the pushed class condition.

Table 10: Comparisons of the productive test score gains from pre-testing to delayed post-testing (pushed email versus pushed class)

Conditions	N	Mean	SD	Minimum	Maximum	Mann-Whitney U	Z	p
Pushed email	54	12.13	5.01	3	22	701.00	-4.67	.000
Pushed class	54	7.44	3.48	0	14			
Total	108							

In terms of measuring the effect size long term from pre-testing to delayed post-testing for the productive test, an effect size was specified for both comparisons (pushed class versus non-pushed class and pushed email versus pushed class – see Tables 9 and 10) in line with answering the second sub question of the first research question and testing the third hypothesis. Further-

more, it was determined that the combination of email and the pushed condition had an additional benefit over and above its use in the classroom. Once the two comparisons above had confirmed the third hypothesis, the effect size was used to define whether or not the effect size of pushed email was greater than expected compared to that of the pushed class, answering the second sub-question of the first main research question.

In terms of Table 9, the Mann-Whitney U test discovered a significant difference in the gain scores of pre-testing to delayed post-testing of the pushed class ($M = 7.44$, $n = 54$) and the non-pushed class ($M = 4.39$, $n = 54$); the value of z was -4.44 , with a significance level of the p value at $.000$, and a value of r^2 at $.18$, giving an effect size of $.18$, which, according to Cohen (1988), indicates a medium level of effect.

In terms of Table 10, the Mann-Whitney U test revealed a significant difference in the gain scores of pre-testing to delayed post-testing of the pushed email ($M = 12.13$, $n = 54$) and the pushed class ($M = 7.44$, $n = 54$); the z value was -4.67 , with a p value of $.000$, and the value of r^2 was $.20$. Thus, the effect size was $.20$, which, according to Cohen (1988), indicates a medium effect size, although it is close to a large effect (i.e. $.25$).

The results of effect size provided support for the effect of completing exercises via email, as the pushed output was higher ($r^2 = .20$) than the effect of pushed output in the classroom ($r^2 = .18$). This refers to the gain scores from pre-testing to delayed post-testing for the productive test.

5.1.4 Summary of the effect size for the productive test

As shown in Table 11, the largest effect size for the gain scores across the short and long terms was for pushed email versus the pushed class. From the pre-test to the post-test, the score was $.26$, a large size according to Cohen (2013). Moreover, the short period (pre-test to post-test) revealed that the pushed email class had a greater effect size than the pushed class, meaning that the students who completed their exercises via email outside the class using pushed output exhibited a larger effect size than the students who were engaged in pushed output in the classroom. The long period, which covered the pre-test to the delayed post-test, revealed that the pushed email class had a greater effect size than the pushed class ($.20$ compared to $.18$). Although both effects were medium in size, the pushed email class received a score of $.20$ compared to $.18$ for the pushed class. In other words, students who completed their exercises via email outside the class and who used pushed output exhibited a greater effect size than those who engaged in pushed output in the classroom.

Table 11: Effect size for the productive test

	Pushed class versus non-pushed class	Pushed email versus pushed class
Pre-test to post-test	.19 (medium size)	.26 (large size)
Pre-test to delayed post-test	.18 (medium size)	.20 (medium size)

5.2 Vocabulary Knowledge Scales Test Analysis

5.2.1 Data analysis of the vocabulary knowledge scales test

Before considering the research questions exploring the VKS test, the Kolmogorov-Smirnov test was conducted to determine whether the sample was normally distributed for the pre-tests, post-tests and delayed post-tests. The examination was conducted and the decision was to utilise non-parametric tests (see Chapter 4, Section 4.8).

Coding the pre-test, post-test, and delayed post-test for all three conditions was the initial step in analysing the VKS test. Coding the pre-test, post-test, and delayed post-test scores for each of the three conditions (pushed class, pushed email, and non-pushed email) was used to conduct the analysis. The descriptive statistics of the mean values for each condition at three time periods are displayed in Figure 4.

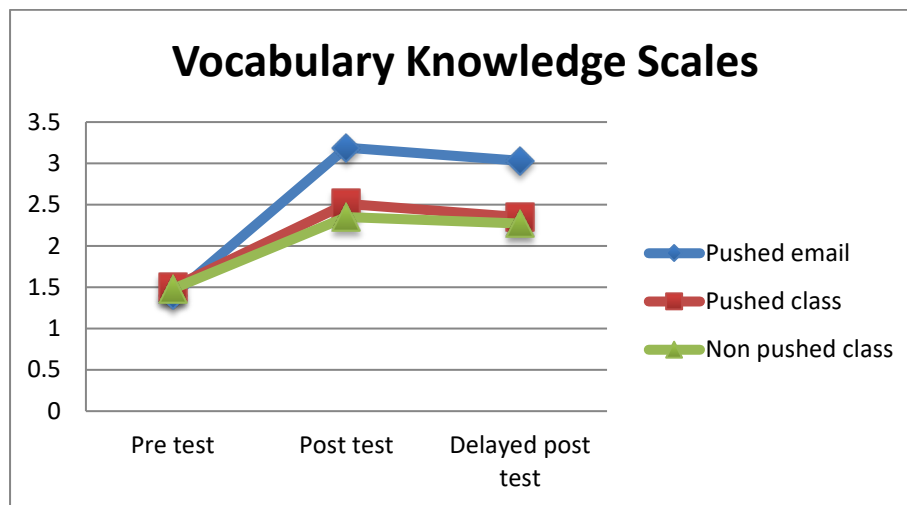
Using SPSS, the independent variable (three conditions) and dependent variable (gain scores) were compared. A variable 'ID' containing student identifiers was created, and a variable 'groups' with the values 1, 2, and 3 was constructed to represent the three conditions. The variables pushed email, pushed class, and non-pushed class were assigned to the 'conditions' variable. Three additional variables were constructed to depict the pre-test, post-test, and delayed post-test scores on a four-point scale for each condition and time period.

To eradicate ordering effects, the target words were divided into three sets of 30 words and presented in counterbalanced conditions (pushed class, pushed email, and non-pushed class). The division of the target words into sets is described in Appendices 8 and 9, where it is stated that the first 30 words comprise set 1, the second 30 words comprise set 2, and the last 30 words comprise set 3.

Scores range from 4 on the vocabulary knowledge scales test (for more information, see chapter 4, section 4.6.2). For instance, the first condition for the first student who used 30 words resulted in a score of 4, with each word receiving a score of 4. Thus, the average score for the 30 terms was 4, and similarly for the other conditions (see Appendices 11 and 12).

Figure 4 depicts the descriptive statistics, displaying the mean scores for each condition at each of the three time periods, with a distinct line for each condition. As seen in Figure 4, the mean pre-test scores for the three conditions were low (1.4, 1.5, and 1.48 out of 4), indicating that the students were unfamiliar with the VKS test's vocabulary. In addition, the results demonstrated that there were no significant differences between the students. The post-test scores for the three conditions improved significantly over the pre-test scores, and although the delayed post-test scores decreased, they still demonstrated a significant improvement relative to the pre-test scores.

Figure 4: Pre, post and delayed tests of VKS



As shown in Figure 4, the post-test scores increased for all three conditions, with the increase appearing greater for the pushed email condition than for the pushed class and non-pushed class conditions. This shows that the students learned more in the pushed email condition. In terms of the delayed post-tests, although the scores decreased, they were still an improvement on the pre-test scores, and the increase was seen in the pushed email condition rather than in the other two conditions.

The Kruskal–Wallis test, which is a non-parametric comparing the outcomes for continuous variables (the VKS pre-test scores), was used to judge the three conditions for each student in order to determine if there was a significant difference amongst the three conditions. This test was utilised because it is the main non-parametric test for comparing three variables, and the purpose of the pre-tests was to identify the students' levels before starting the treatment. The reasons for choosing this particular test are explained in more detail in Chapter 4 (Section 4.8). As this was a between-condition analysis, different students applied the three conditions in a different order (for more details, see Chapter 4, Section 4.7).

The Kruskal–Wallis test findings revealed no significant differences amongst the three conditions (Kruskal–Wallis = 5.451, $P = .065$, $df = 2$), illustrating that the p values for the three conditions were not less than 0.05.

Table 12: Comparison of Three Conditions on VKS Test Performance by Students

Conditions	Pre-test	Post-Test	Delayed post-test	Gain scores from pre-testing to post- testing	Gain scores from pre-testing to delayed post-testing
Non - Pushed Class	1.48	2.35	2.27	0.87	0.77
Pushed class	1.5	2.51	2.35	1.00	0.89
Pushed Email	1.4	3.19	3.03	1.79	1.63

Table 12 shows the results of comparing the instructional effectiveness of three pedagogical techniques. There are six columns in this table: Conditions, Pre-test, Post-test, Delayed post-test, Gain scores from pre-test to post-test, and Gain scores from pre-test to delayed post. Non-Pushed Class, Pushed Class, and Pushed Email are shown in the first column. Each group's average pre-, post-, and delayed post-test results are presented in the next three columns. The final two columns reflect each group's gain scores from pre-testing to post-testing and delayed post-testing. The gain score was calculated by subtracting pre-test from post-test or delayed post-test scores.

According to Table 12, each of the three instructional methods improved student performance from pre-test to post-test and delayed post-test. However, the Pushed Email condition performed the best in both tests. The average gain score for the Pushed Email condition was 1.79 from pre-testing to post-testing and 1.63 from pre-testing to delayed post-testing.

This suggests that the condition of Pushed Email might improve student performance. The following sections offer further examination and investigation.

5.2.2 Effect of condition on VKS test word learning in the short term

This section analyses the effect of the pushed email, pushed class and non-pushed class conditions on the word learning of VKS test in the short term, i.e. from pre-testing to post-testing. In order to answer the second sub-question of the first main research question and test hypothesis three, a statistical analysis of the gain scores of the pushed class versus the gain scores of the

non-pushed class as well as the gain scores of pushed email versus the gain scores of the pushed class was conducted. This analysis compared the gain scores from the pre-test to the post-test for the VKS test for each comparison (see Table 12 and Table 13). In sum, the groups were compared in this way due to the 2x2 design, which investigated both the pushed class and the non-pushed class (comparison one), and the pushed class versus pushed email (comparison two). This analysis compared the gains in the scores from the pre-test to the post-test for the VKS test relating to the two comparisons (see Table 12 and Table 13).

The first comparison began with the gain scores from the pre-tests and post-tests of the VKS test between the pushed class and the non-pushed class; the Mann-Whitney U test was applied to determine if there was a significant difference between the two independent variables of the pushed class and the non-pushed class. The results of the Mann-Whitney U test are presented in Table 12. As can be seen, there was a significant difference between the pushed class condition and the non-pushed class condition, with a p value of less than 0.05 (see Table 12).

In order to determine which condition core was higher, standard deviation, minimum, maximum and mean gain scores were obtained from the pre-testing to the post-testing stages, as shown in Table 12. As can be observed from Table 12, there was a significant difference between the pushed class and the non-pushed class, with a p value of .001. The pushed class condition score was higher, with a mean of 1.00 and a standard deviation of 0.21, in comparison to a mean score of 0.87 and a standard deviation of 0.22 for the non-pushed class.

Table 12: Comparison of the VKS test score gains from pre-testing to post-testing (pushed class versus non-pushed class)

Conditions	N	Mean	SD	Minimum	Maximum	Mann-Whitney U	Z	p
Pushed class	54	1.00	0.21	.60	1.40	933.00	-3.23	.001
Non-pushed class	54	0.87	0.22	.53	1.46			
Total	108							

In terms of the second comparison - between pushed email and pushed class - the Mann-Whitney U test was used to analyse the gain scores from the pre-test to the post-test period for the VKS test and to determine whether there was a significant difference between them (see Table 12). The Mann-Whitney U test revealed a significant difference between the pushed email condition and the pushed class condition, with a p value of less than 0.05 (see Table 13).

To determine which condition scored higher, SPSS was used to determine the standard deviation, minimum, maximum and mean gain scores from the pre- to the post-test (see Table 13).

Table 13 shows a p value of .000, indicating a significant difference between pushed email and the pushed class. The pushed email condition score had a mean score of 1.80 and a standard deviation of 0.24, compared to a mean score of 1.00 and a standard deviation of 0.21 for the pushed class condition.

Table 13: Comparison of the VKS test score gains from pre-testing to post-testing (pushed email versus pushed class)

Conditions	N	Mean	SD	Minimum	Maximum	Mann-Whitney U	Z	p
Pushed email	54	1.80	0.24	1.23	2.30	15.00	-8.87	.000
Pushed class	54	1.00	0.21	.60	1.40			
Total	108							

In terms of measuring whether the combination of email and pushed output had an additional benefit, it can be seen that, according to the two comparisons shown in Table 12 and Table 13, pushed email and the pushed class obtained high scores and statistics relating to gains in the pre-testing and post-testing of the VKS test, confirming the first two hypotheses. The effect size was used to calculate the two comparisons (pushed class versus non-pushed class and pushed email versus pushed class) to determine whether the size effect of the pushed email condition indicated greater benefits than that of the pushed class condition.

In terms of the effect size (see Table 12), the Mann-Whitney U test revealed a significant difference between the scores in the gains from the pre-testing to the post-testing of the pushed class ($M = 1.00$, $n = 54$) and the non-pushed class ($M = 0.87$, $n = 54$); the z value was -3.23, with a p value of .001, and the value of r^2 was 0.10, meaning that the effect size was .10 which, according to Cohen (1988), indicating a medium effect.

In terms of the effect size (see Table 13), the Mann-Whitney U test revealed a significant difference in the gain scores of pre-testing to post-testing for the pushed email ($M = 1.80$, $n = 54$) and the pushed class ($M = 1.00$, $n = 54$); the value of z was -8.87, with a significant p value of .000, and the value of r^2 was .73. Thus, the effect size was .73, which, according to Cohen (1988), is a large-sized effect.

Overall, the effect of completing exercises via email with pushed output was greater than the effect of completing exercises with pushed output in the classroom. This refers gain scores from pre-testing to post-testing for the VKS test.

5.2.3 Effect of condition on VKS test on word leaning in the long term

This section analyses the effect of the pushed email, pushed class and non-pushed class conditions on VKS test on word learning in the long term, which means from pre-testing to delayed post-testing. In order to answer the second sub-question of the first main research question and test the hypothesis three in the long term, a statistical analysis of the gain scores from pre-testing to delayed post-testing of the pushed class versus non-pushed class and pushed email versus pushed class was conducted. This analysis compared the gains in scores for the VKS test (see Table 14 and Table 15).

In the first comparison, the Mann-Whitney U test was applied (see Table 14) in order to juxtapose the two independent variables (pushed class and non-pushed class) to determine whether there was a significant difference between them. The results of the Mann-Whitney U test (see Table 14) revealed a significant difference between the pushed class condition and the non-pushed class condition, at $p < 0.05$.

To determine which condition received a higher score than the other conditions, SPSS was used to determine the standard deviation, minimum, maximum and mean gain scores from the pre-testing to the delayed post-testing stages (see Table 14). Table 14 shows that the p value was .002, indicating a significant difference between the pushed class and the non-pushed class, and that the pushed class condition obtained a high score, with a mean of 0.90 and a standard deviation of 0.22 compared to the non-pushed class condition ($M = 0.77$, $SD = 0.22$).

Table 14: Comparison of the VKS test score gains from pre-testing to delayed post-testing (pushed class versus non-pushed class)

Conditions	N	Mean	SD	Minimum	Maximum	Mann-Whitney U	Z	p
Pushed class	54	0.90	0.22	.43	1.38	951.00	- 3.12	.002
Non-pushed class	54	0.77	0.22	.43	1.36			
Total	108							

In the second comparison, the Mann-Whitney U test was used to analyse the gain scores from the pre-test to the delayed post-test period for the VKS test between pushed email and the pushed class to determine any difference between them (see Table 15). The Mann-Whitney U test revealed a significant difference between the pushed email condition and the pushed class condition, with a p value of less than 0.05 (see Table 15).

To determine which condition obtained the higher score, SPSS was used to identify the standard deviation, minimum, maximum and mean gain scores from the pre-test to the delayed post-test

stages (see Table 15). As Table 15 shows, the p value was .000, which indicates a significant difference between the pushed email and the pushed class, while the pushed email condition received a high mean of gain score of 1.63 and a standard deviation of 0.24 in comparison to the mean gain score and standard deviation of the pushed class condition, at 0.90 and 0.22, respectively.

Table 15: Comparisons of the VKS test score gains from pre-testing to delayed post-testing (pushed email versus pushed class)

Conditions	N	Mean	SD	Minimum	Maximum	Mann-Whitney U	Z	p
Pushed email	54	1.63	0.24	1.13	2.11	27.00	-8.80	.000
Pushed class	54	0.90	0.22	.43	1.38			
Total	108							

In terms of measuring the long-term effect size from pre-testing to delayed post-testing for the VKS test, a statistical benefit was specified for both comparisons (pushed class versus non-pushed class and pushed email versus pushed class – see Table 14 and Table 15), answering the second sub question of the first research question and testing the third hypothesis. It was determined that the combination of email and the pushed condition had an additional benefit over and above the use of the same method in the classroom. After the two comparisons confirmed the third hypothesis, the effect size was used to define if the size effect of pushed email was greater than expected compared to that of the pushed class, answering the second sub question of the first research question.

As Table 14 shows, the Mann-Whitney U test discovered a significant difference in the gain scores of pre-testing to delayed post-testing of the pushed class ($M = 0.90$, $n = 54$) and the non-pushed class ($M = 0.77$, $n = 54$); the value of z was - 3.12, with a p value of .002, and the value of r^2 was 0.10. Thus, the effect size was .10, which, according to Cohen (1988), indicates a medium level of effect.

In terms of Table 15, the Mann-Whitney U test revealed a significant difference in the gain scores of pre-testing to delayed post-testing of the pushed email ($M = 1.63$, $n = 54$) and the pushed class ($M = 0.90$, $n = 54$); the value of z was -8.80, with a p value of .000, and the value of r^2 was .72. Thus, so the effect size was .72; according to Cohen (1988), this effect size is a large effect.

The findings regarding the effect size provided support for the effect of completing exercises via email with pushed output, as the score was higher ($r^2 = .72$) than the effect of pushed output

in the classroom ($r^2 = .10$). This referred to gain scores from pre-testing to delayed post-testing for the VKS test.

5.2.4 Summary of the effect size in the VKS test

The greatest effect size of the gain scores in the short and long terms was for pushed email versus pushed class from the pre-testing to post-testing stages, with a score of .73 (see Table 16), which is a large-sized effect according to Cohen (1988). Furthermore, the short term (pre-test to post-test) revealed that pushed email had a large-sized effect compared to the medium effect size for the pushed class; this indicates that students who engaged in the activity via email outside the class using pushed output had a higher effect size than students engaging in pushed output in the classroom. With regard to the long term, which was from pre-testing to delayed post-testing, pushed email obtained a greater size effect than the effect size of the pushed class (.72 compared to .10). In other words, students who completed the exercises via email outside the class utilising pushed output had a higher effect size than students who engaged in pushed output in the classroom.

Table 16: Effect size of VKS test

	Pushed class versus non-pushed class	Pushed email versus pushed class
Pre-test to post-test	.10 (medium size)	.73 (large size)
Pre-test to delayed post-test	.10 (medium size)	.72 (large size)

5.3 Comparative Examination of Student Writing Examples

In previous sections, I analysed the three conditions using gain scores from pre-tests to post-tests and from pre-tests to delayed post-tests. It was discovered that pushed output produced better results than non-pushed output, and that pushed email was more efficient than a pushed class. In this section, I compare the use of prescribed vocabulary in the writing of three students from each of the three experimental groups at various points throughout the experiment. I collected three samples of each student's writing for each condition, giving a total of nine samples per condition across the 27 scripts (see Figure 5), ensuring that the sample was representative of all proficiency levels. This process of selection yielded three individuals (one from each group) to be included in the analysis.

To achieve this, I gathered 27 writing samples, consisting of three samples in weeks 1, 3, and 5, for a total of nine samples per participant. In other words, I collected three writing samples from each student for each condition, for a total of nine samples per condition across the 27 scripts. These writing samples were analysed using two methods: a quantitative analysis of

vocabulary size, as outlined by Meara and Miralpeix (2016), and a qualitative analysis of Engber’s (1995) taxonomy of lexical errors based on two dimensions: lexical choice and lexical form (section 4.9 of the methodology chapter contains additional information).

To begin with, let me clarify the three conditions: The pushed email condition required the students to compose a narrative using six target words and to receive feedback from their instructor via email. In the pushed class condition, the students composed a narrative utilising six target words and received immediate feedback from the instructor during class. In the non-pushed output class condition, the students learned the target words using traditional teaching methods, such as writing the six items in sentences during class, without receiving any feedback or encouragement from the teacher (details of word distribution for all groups can be found in section 4.7 of the methodology chapter).

In section 4.9 of the methodology chapter, the reasons for not employing alternative measurements are elaborated. The following section presents a quantitative analysis of vocabulary size using V-words. This analysis will provide valuable insights into the three conditions of language instruction and their potential outcomes.

5.3.1 Quantitative Analysis of Vocabulary Size

Analysing the vocabulary size (VS) of each of the 27 writing samples collected, with each student submitting nine samples during weeks 1, 3, and 5, a consistent trend favouring the pushed email condition can be observed. In week 1, the student in group 2 assigned to pushed email achieved the highest VS, at 132, followed by the student in group 3 assigned to pushed email, at 105, and then the student in group 1 assigned to pushed email, at 99. Comparatively, the other conditions in each group had smaller vocabulary sizes. Multiple groups' vocabulary learning is enhanced by the pushed email condition, as indicated by this pattern.

Figure 5: Comparative Analysis of Student Writing Samples

Week 1				
ID	Group	Pushed output	Pushed email	Non pushed class
7	1	VS: 75	99	60
21	2	70	132	66
37	3	51	105	57
Week 3				
ID	Group	Pushed output	Pushed email	Non pushed class

7	1	72	92	59
21	2	66	106	66
37	3	42	111	53
Week 5				
ID	Group	Pushed output	Pushed email	Non pushed class
7	1	60	100	54
21	2	35	95	59
37	3	51	80	62

Considering week 3, the trend persists. The student in group 2 assigned to pushed email maintained the greatest VS of 106, while group 1 assigned to pushed email attained a VS of 92 and group 3 assigned to pushed email had a VS of 111. Comparatively, the vocabulary sizes of the remaining conditions within each group were smaller.

Even though vocabulary quantities decreased marginally among the three selected students during week five, the pushed email condition still exhibited notable results. The student in group 2 assigned to pushed email earned a VS of 95, whereas the student in group 1 assigned to pushed email earned a VS of 100 and the student in group 3 assigned to pushed email earned a VS of 80. Comparatively, the vocabulary sizes of the other conditions in each group were smaller. These results indicate that the pushed email condition was effective at sustaining vocabulary growth over time.

In terms of vocabulary size, the refinement of the analysis across all three groups supports the hypothesis that pushed email is the most effective condition; across all categories, the pushed email condition consistently resulted in larger vocabulary sizes than the other conditions.

5.3.2 Qualitative Lexical Error Analysis of Student Writing

Lexical errors are one of the most frequent and persistent categories of mistakes made by second-language learners. They can influence the accuracy, clarity, and propriety of communication and reveal the learners' level of proficiency and development. Engber (1995) proposed a classification of lexical errors based on two dimensions: lexical choice and lexical form. Lexical choice refers to the selection of suitable words to convey the intended meaning, whereas lexical form refers to correct spelling, verb forms, and derivational errors.

In this qualitative analysis, I apply Engber's taxonomy to a sample of student writings and illustrate specific error categories, such as lexical choice and form errors (see section 4.9.2 for additional information on employing Engber's taxonomy). By providing examples, the analysis becomes more thorough and illuminating, shedding light on the nature of errors made by students under various instructional conditions. The analysis is separated into two main sections: lexical choice and form errors. Each section is subdivided further into individual lexical items and combinations for lexical choice errors and derivational errors, verb forms, and substantial orthography errors resulting from word distortion for lexical form errors.

I identified 30 lexical errors in the writings of 27 students by coding the data in Excel. I analysed each category of lexical error for each student and instance. Possible causes of the errors include insufficient vocabulary knowledge, L1 interference, and confusion between words with similar meanings. Examples of group 1's lexical choice errors from week 1 include:

Group 1 in Week 1:

1. Individual lexical items: "They often receive a low rate on their home works and exams". (pushed class)

Error: The incorrect use of "rate" instead of "grade" or "score" in the context of evaluating homework and exams.

2. Combinations: "He didn't always heed the warnings of beware of people who wanted to take advantage of him". (pushed email)

Error: The incorrect use of "heed the warnings of beware of" instead of "heed the warnings to beware of" or "heed the warnings about" to express caution.

3. Verb forms: "When their teacher disapprove of their work in front of the whole class". (pushed class)

The use of "disapprove" instead of "disapproves" is inaccurate. These errors can have a negative impact on the sentence's readability and meaning.

Group 1 in Week 3:

1. Individual lexical items: "After editing, Sarah was able to see resolution to her writing". (pushed class)

Error: The incorrect use of "resolution" instead of "improvement" or "enhancement" in relation to Sarah's writing.

2. Combinations: "If the combine does not do their efforts". (pushed email)

Error: The incorrect use of "combine" instead of 'they do not combine' in the context of collective efforts.

3. Verb forms: "She began highlight the words". (pushed class)

Error: The lexical form error in the sentence "She began highlight the words" lies in the verb form used. The correct verb form should be "highlighting" instead of "highlight."

Group 1 in Week 5:

1. Individual lexical items: "Soak as much knowledge as I could and volunteer to help". (pushed class)

Error: The incorrect use of "soak" instead of "acquire" or "absorb" in the context of gaining knowledge.

2. Combinations: "My teacher announced that they were looking for volunteers and assists with a school project that required strong English skills". (pushed class)

Error: The incorrect use of "assists" instead of "assistance" or "help" in the context of volunteering for a school project.

3. Verb forms: "I constructed an expectation that the isolated animals from their natural habitat due to human activities". (pushed email)

Error: Lexical form errors occur when a word or part of a word does not follow target language rules or patterns. Spelling, prefixes, suffixes, and word formation are examples. The adjective "isolated" should be a past participle verb. "Isolated" means "separated" or "minimal contact." "Isolate" means "separate from others" or "minimise contact with others". Corrected sentence: I constructed an expectation that human activities had isolated the animals from their natural habitat.

Additionally, a spelling error is mentioned in the non-pushed class example:

4. Spelling error: "I tried a lemon for the first time, and it was too sourd for me."

By providing specific examples within each category, such as improper word usage, incorrect word combinations, and orthography errors, the qualitative analysis provides a thorough understanding of the lexical errors made by students across a variety of instructional conditions and periods.

Evidently, the student in group 1 of the pushed class committed lexical form errors involving verb forms in weeks 1 and 3. In contrast, no such error was observed during week 5. This indicates an increase in lexical form errors in verb usage in the pushed class over the course of several weeks.

Below is a qualitative analysis of the lexical errors made by the group 2 student using Engber's (1995) taxonomy of lexical errors as a framework for the analysis of the selected examples.

Group 2 in Week 1:

1. Individual lexical items: "As the market started to wreck, the value of Faisal investment start to decrease". (pushed email)

Error: The incorrect use of "wreck" instead of "wreckage" or "crash" in the context of the market.

2. Verb forms: "The prices would varying greatly from one day to day". (pushed email)

Error: The incorrect verb form, "varying," should be replaced with "vary" to maintain proper tense consistency.

Group 2 in Week 3:

1. Individual lexical items: "She could easily have highlighted the key points her resolution and edit her work". (pushed email)

Error: This sentence contains a lexical error because "resolution" does not fit the meaning or context. Lexical errors affect message delivery. This sentence should use "improvement".

2. Combinations: "I saw a robot that can to operate by itself, it was so cool". (non-pushed class)

Error: The incorrect phrasing of "that can to operate" instead of "that can operate" or "capable of operating."

3. Verb forms: "She could easily have highlight the key points". (pushed email)

Error: Lexical form Verb form errors occur when a word or part violates target language rules. "She could easily highlight the key points". (delete "have").

Group 2 in Week 5:

1. Individual lexical items: "The artist and my sister's suggestions would often defy and she would get frustrated". (pushed email)

Error: The incorrect use of "defy" instead of "differ" or "conflict" in relation to suggestions.

2. Verb forms: "I need isolated myself in a quite room to study for my exam". (non-pushed class)

Error: Word form errors occur when a word or part of a word violates the norms of the target language. Using a noun in place of a verb, as well as the incorrect tense or number. An example contains a misuse of "isolated." The essential verb, "need," requires a base or infinitive form. The past tense or past participle of "isolate" — "isolated" — does not belong in this context. "Isolate" is the precise term. Therefore, the correct sentence is: I need to isolate myself in a quiet room to study for my exam.

In this analysis, the examples provided illustrate various categories of lexical errors, including errors involving individual lexical items and verb forms. The errors occurred across a range of instructional conditions (pushed class, pushed email, and non-pushed class) and weeks (week 1, week 3, and week 5). These examples illustrate the variety of student errors in various contexts. Evidently, the student in group 2 of the pushed email committed lexical form errors related to verb forms during weeks 1 and 3. In contrast, no such error was observed during week

5. This indicates the development of lexical form errors in verb usage across the weeks in the pushed email.

Using Engber's (1995) taxonomy of lexical errors as a framework for the analysis of the selected examples, the following section provides a qualitative analysis of the lexical errors made by the students in group 3.

Group 3 in Week 1:

1. Individual lexical items: "The teacher had to beware of the plagiarism". (pushed class)

Error: Individual lexical choice errors occur when a writer employs the incorrect term or phrase in a given context. Beware means to avoid danger. This does not fit the sentence's context about the teacher's plagiarism awareness. Be aware, which means to understand, is better.

2. Derivational errors: "Peter learned the importance of forgive and let go of his negative thoughts". (pushed email)

Error: The incorrect use of "forgive" as a noun instead of the correct form "forgiveness" as a noun.

3. Verb forms: "My teacher asks me to give rate to book". (non-pushed class)

Error: The incorrect use of "give a rating to" instead of "rate" or "assign a rating to" in reference to a book.

Group 3 in Week 3:

1. Individual lexical items: "The teachers agreed and they started to operate on a plan to help them". (pushed class)

Error: The incorrect use of "operate on" instead of a more suitable phrase like "work on" or "implement" in relation to a plan.

Group 3 in Week 5:

No errors identified.

In this analysis, the provided examples illustrate various categories of lexical errors, such as individual lexical items, errors in derivation, and verb forms. Various instructional conditions (pushed class, pushed email, non-pushed class) and weeks (week 1, week 3, week 5) contain inaccuracies. These examples cast light on the character of student errors in various contexts.

Noteworthy is the fact that no errors were found in the examples for group 3 during week 5, indicating a possible improvement in lexical choices and forms during that time frame. In addition, it is noteworthy that the student who made individual lexical item errors in the pushed class showed an improvement in week 5, as errors were recorded in both week 1 and week 3, but not in week 5.

5.3.3 Comprehensive Examination of Student Writing Samples

Comparing writing excerpts from pushed email, the pushed class, and the non-pushed class conditions sheds light on the efficacy of language instruction. The quantitative analysis of vocabulary size revealed that, across all 27 writing samples, the pushed email condition consistently produced greater vocabulary sizes. These samples included three writing samples from each student for each condition, for a total of nine samples per condition. Pushed email accelerated and maintained vocabulary growth. The purpose of this qualitative analysis was to identify and classify lexical errors made by L2 learners in a sample of student writings. On the basis of lexical choice and lexical form, Engber's (1995) taxonomy of lexical errors was applied to the analysis. There were provided examples of specific error categories, such as improper word usage, misspellings, and verb form errors. The analysis uncovered frequent errors across a variety of instructional conditions and periods. Over time, notable improvements were observed in the lexical choices and forms of some students. This analysis provides valuable insights into the nature of lexical errors made by students and their progress in language learning by highlighting these errors and their development.

5.4 Students' Attitudes towards Using Email

5.4.1 Reliability of section 1 of the Likert-scale questionnaire

This section addresses the second main research question: 'What are students' experiences of and attitudes towards studying vocabulary using email as part of a technology enhanced learning approach to use vocabulary?' The first step to run descriptive statistics before statistical analysis using SPSS was a reliability analysis to calculate Cronbach's alpha, which was carried to confirm the reliability measures of the questionnaire about 'attitudes and experiences towards using email' scales and their subscales in the current research. Before analysing for reliability, 20 items of students' attitudes were coded, and negative items were reversed (i.e., scale 1 became strongly agree and scale 5 became strongly disagree). As seen in Figure 6, the resulting score was .727, which represents a good level of internal consistency of reliability according to Cronbach (Nunnally, 1978).

Figure 6: Cronbach's Alpha Reliability Coefficients for questionnaire

Cronbach's Alpha	N of Items
.727	20

5.4.2 Descriptive statistics for the questionnaire about attitudes and experiences towards using email in terms of the section 1 Likert scales

The third part of the main study after the treatment analysed responses to the questionnaire (consisting of 20 items and using a scale of (1) strongly disagree to (5) strongly agree) of attitudes and experiences towards using email for all three groups and to determine their attitudes. The questionnaire was completed by 54 students and revealed some interesting results. First, there were three sections of the questionnaire, namely: Students’ experiences and attitudes towards learning vocabulary, using email, and combining learning vocabulary with using email. Half of each section was positive, and half was negative. The analysis was divided and presented in three tables. Each table contains positive and negative statements. The mean scores allocated by the 54 students for the positive statements using a five-point scale to rate the statements are shown in the first section of Table 17. The mean scores allocated by the 54 students for the negative statements using a five-point scale to rate the statements are shown in the second section of Table 17. Reversed mean scores mean that the scale was reversed from (1) strongly disagree to (5) strongly agree to become a scale of ranging from (1) strongly agree to (5) strongly disagree.

Table 17: Experiences with and attitudes towards learning vocabulary = (N= 54)

Learning vocabulary + Positive statements	N	Mean	
I am interested in learning / studying English vocabulary	54	3.19	
Five weeks are enough for learning new words	54	2.67	
I study new words and then practise using them.	54	3.19	
Learning vocabulary + Negative statements	N	Actual mean	Reversed mean
Learning vocabulary is not important for learning a foreign language.	54	2.09	3.91
It is not easier to learn new words when they are presented in context.	54	1.85	4.15
I cannot acquire a large foreign language vocabulary simply by writing a lot.	54	2.24	3.76

As observed in Table 17, there were two sections pertaining to students’ experiences and attitudes towards learning vocabulary, one for positive and one for negative statements. The majority of the students agreed with two of the positive statements, namely ‘I am interested in learning English vocabulary’ and ‘I study new words and then practise using them’. With regard to the negative statements, the majority of the students disagreed with the statement ‘It is not easier to learn new words when they are presented in context’.

Table 18: Experiences and attitudes with using email = (N= 54)

Using email + Positive statements	N	Mean	
It is easier to contact my instructor through email than other application.	54	3.26	
It is easy to download email in my cell phone.	54	2.8	
Using email helped me access additional info, outside of using my textbooks.	54	3.48	
Using email + Negative statements	N	Actual mean	Reversed mean
I did not enjoy using an email to learn.	54	2.15	3.85
Using the email did not help me become more confident in my learning.	54	1.94	4.06
Using email did not allow me to interact better than in the class.	54	2.02	3.98

As observed in Table 18, there were two sections of students' experiences and attitudes of using email, namely positive and negative statements. In terms of positive statements, the majority of the students agreed with the statement 'Using email helped me access additional information outside of using my textbooks'. Moreover, the majority of students disagreed with the negative statement 'Using the email did not help me become more confident in my learning'.

Table 19: Experiences and attitudes with learning vocabulary by email = (N= 54)

Combining vocabulary and email + Positive statements	N	Mean	
Learning vocabulary by email is helpful to my learning	54	3.24	
Learning vocabulary by email helps me develop a sense of participation.	54	3.46	
Learning vocabulary by email makes me understand vocabulary more than classroom-based exercise	54	3.39	
Learning vocabulary by email is not time-consuming.	54	3.37	
Combining vocabulary and email + Negative statements	N	Actual mean	Reversed mean
Learning vocabulary by email cannot improve my skills in written communication	54	1.65	4.35
Learning vocabulary by email does not motivate me to learn.	54	1.78	4.22
Activities of learning vocabulary by email does not increase the interaction between my teacher and me	54	1.98	4.02
I am not satisfied in learning words on the technology-based exercise	54	1.96	4.04

As shown in Table 19, there were two sections of students' experiences and attitudes of learning vocabulary via email, namely positive and negative statements. In terms of positive statements, the majority of students agreed with the statement 'Learning vocabulary by using email helps me to develop a sense of participation'. Moreover, in terms of negative statements, the majority of the students disagreed with the negative statement 'Learning vocabulary by using email cannot improve my skills in written communication'.

5.4.3 A quantitative analysis linking the questionnaire results to the scores for the productive and VKS tests

In terms of the productive test, quantitative analysis was used firstly to investigate the relationship between the questionnaire results on students' receptiveness to technology (email) and the gain scores of the productive test from the pre-test to the post-test using email via pushed output. These factors were used to run Spearman's rho correlation coefficient as the non-parametric alternative, which fits the current study. The total score for the relevant questions was used as the independent variable and the dependent variable was the degree to which the students' scores in the pre-test and post-test differed (see Appendix 5). The findings revealed a very weak negative correlation between the two variables, at $r = -.032$. As Cohen (1988) stated, this is considered to indicate a weak relationship, while Pallant (2010) also noted that a value of $-$ can be considered to indicate a negative relationship.

In terms of the investigation of the relationship between the questionnaire results regarding the students' receptiveness to email and the gain scores of the productive test from the pre-test to the delayed post-test using email via pushed output (see Appendix 5), the findings revealed a slight relationship between the two variables, at $r = -.222$.

Beginning with a correlation analysis between total scores and VKS test scores to investigate the relationship between the questionnaire results regarding the students' receptiveness to technology (email) and the gain scores of the VKS test from the pre-test to the post-test using email via pushed output (see Appendix 5), the findings revealed a weak negative relationship between the two variables, at $r = -.010$.

In terms of the investigation of the relationship between the questionnaire results regarding the students' receptiveness to technology (email) and the gain scores of the VKS test from the pre-test to the delayed post-test using the email via pushed output (see Appendix 5), the findings revealed a slight relationship between the two variables, at $r = .110$.

5.5 Qualitative Questionnaire

In this section, I present the qualitative results with respect to asking about the learners' attitudes by using open-ended questions, such as questions concerning how the participants felt about using email, questions about the advantages and disadvantages of using email to learn vocabulary, questions pertaining to the reasons that using email help the students to learn new words, and questions about the advantages and disadvantages of learning in class without email for studying English vocabulary.

The quantitative results were presented in the previous section, but many questions remain unanswered; for example, how the participants felt about using email, what the advantages and disadvantages were of using email to learn vocabulary, and the reasons that using email helps the students to learn new words (if using email had helped them to do so).

The previous section included statistical analyses, which illustrated the students' experiences and attitudes towards learning vocabulary, their experiences and attitudes towards using email and, finally, their experiences and attitudes towards learning vocabulary via email. It was considered important to extend these results by determining and evaluating precisely how the participants felt about using the email intervention and the advantages and disadvantages of using email to learn vocabulary in order to provide major insights into the findings.

For example, it was essential to understand the students' experiences and attitudes towards using email to learn new items, as well as their feelings about the intervention, whether they thought the use of the email affected their learning of vocabulary, and to identify any issues or disadvantages.

To address all these questions and issues, an open-ended survey was distributed to all 54 students to obtain a complete picture of their experiences and attitudes towards using email to learn vocabulary.

Thematic analysis was conducted to analyse the open-ended survey. Thus, the current data were classified according to themes and were then interpreted as codes, sub-codes, and patterns (Bryman, 2008) (see Chapter 4, Section 4.8). Thematic analysis provided more knowledge about the phenomenon under examination (Braun & Clarke, 2006). Following this process, the theme of the participants' attitudes towards and experiences of using email to learn vocabulary were explored in more depth. The analysis of the data obtained from the open-ended questionnaire generated a number of codes concerning the significance of using email in learning English vocabulary and the advantages of using email (such as improving learners' motivation, self-

taught learning, and saving answers online). The difficulties the participants experienced were adapting to using email, such as technical difficulties, and a lack of options concerning handwriting. The following section explains these findings in more detail.

5.5.1 General attitudes towards and experiences of using email.

With regard to the analysis of the data from Section B of the questionnaire, which consisted of open-ended questions that were analysed qualitatively, 47 of the 54 participants in the open-ended survey felt that the use of email was essential for learning vocabulary outside the class, and stated that they were happy to use email in learning. Moreover, 31 of the 54 participants in the open-ended survey identified a positive feature as being able to check their answer at any time. Moreover, these participants felt that the use of email saves time and make it easy to write anywhere at any time; they also felt that they could keep going to utilise the email to learn vocabulary by writing a story format of the given words because they enjoyed learning online by technology. Consequently, they believed that learning via email played a positive role their learning method. Based on the views of the participants given here, it appears that the majority of the participants had positive views regarding using email for learning vocabulary.

In contrast, seven students in the open-ended survey stated that the use of email was hard, and not necessary for learning vocabulary. Moreover, they felt that using email was a waste of time because the Internet is weak, indicating that these participants did not enjoy using email for learning vocabulary rather than learning in the class without email.

5.5.2 Using email as an educational method for learning vocabulary

The majority of the participants in the open-ended survey said that using email as a technology to use vocabulary was important. For example, some participants had the opportunity to write a story using the words provided in their emails and had sufficient time to reflect on their answers without feeling rushed.

In a similar vein, 16 participants said that they preferred to learn vocabulary by email rather than utilising pen and paper to write in the class. Nevertheless, they believed that they improved and increased their vocabulary when they started learning vocabulary with pushed output, indicating the weakness of classical approaches for learning vocabulary. As one participant said:

My vocabulary is actually developed, and I believe this is because I write a story using six words from the teacher every week. I had proof of the development, which is the vocabulary I had was excellent. I consider using the email with writing a story in learning and learning vocabulary is more useful than doing the activity by pen and paper. (Code: 4)

Another participant in the open-ended questionnaire supported the above opinion. She stated she experienced problems with memorising vocabulary and had never understood how to improve this skill; however, she added:

While I started using email to write six words in telling a story, I was surprised how this method can benefit me to develop my vocabulary due to the mixing of the pushed output and using email to practice words in writing a story. For instance, I can write words with storytelling in my own time and place; moreover, I get feed-back from my teacher by email. I have my writing, and my feedback on my own email and I can look at it any time to review. I believe the vocabulary I have is greater than I had. (Code: 32)
(Translated from Arabic)

With regard to their prior opinions, it appears that students were in favour of using email for learning rather than using pen and paper. That could be because they noticed that writing six words in a story format via email helped them to practice using these words at their own pace and place of writing without feeling under pressure, and then receive regular feedback from the instructor each week. Moreover, since they could choose their own space, they could write anytime and anywhere they wished, and then receive regular feedback from the instructor each week. This improved their vocabulary by allowing them to learn new words and avoid the incorrect choice of words in a sentence and incorrect spelling; this was due to using six words to write a story, which led to them practice writing weekly and working on developing their vocabulary. Thus, it would appear that traditional teaching styles may be inefficient in terms of learning vocabulary; as the participants stated, they did not have flexibility in terms of the time and place to practice exercises such as writing and storytelling. As a result, and crucially, they lacked sufficient practice in using vocabulary in the classroom when using traditional teaching methods.

In contrast, two students in the open-ended survey claimed it would be a good idea to have a combination of utilising email with pen and paper to write the six words in storytelling. This indicates that those participants needed to combine approaches to benefit from the advantages of each one to improve their vocabulary. Nevertheless, neither of these participants felt that using six words to write a story by email had improved their vocabulary. In the qualitative questionnaire, seven participants felt that they preferred using pen and paper for writing over writing by using email. They said using paper and pen assists in developing handwriting and, additionally, writing by pen is more comfortable since we do not need a laptop or mobile; we simply find paper and a pen to start writing.

Moreover, thirty participants were of the opinion that using email to send Word documents

improved their vocabulary and writing structure. However, one negative point that was expressed was that online devices interfered with spelling improvement.

Nine of the 54 participants claimed they experienced difficulty spelling words using paper and a pen, observing that using email had assisted them in developing their spelling and decreasing errors. For example, one of the participants said that when she “wrote on a Word document by email any spelling errors automatically corrected, and this is great”; however, she decided to copy the difficult vocabulary and spelling onto a file. Later, she began to use these words regularly.

Based on the students’ views, it appears that using email assisted them in developing their spelling by using the spellcheck function in order to ensure the final correctness of the text. In contrast, three participants claimed that using email had not supported them overcoming their difficulty with spelling errors; indeed, it can make learning even more difficult because the word changed into the correct spelling automatically. It appears that these participants believed that fixing their spelling errors automatically in their answers was not useful, and that they favoured writing without automatic corrections to enable them to correct their spelling errors.

5.6 Benefits of Using Email

Analysis of the collected data revealed that 47 participants described some advantages of using email for learning vocabulary, such as supporting them to adapt to the process of using email, improving learner motivation and self-taught learning, and saving answers online. The section discusses these advantages in detail.

5.6.1 Supporting participants in adapting to the process of using email

Thirty-eight participants felt positively about the impact of using email to write a story using words. They were able to plan, draft, revise and proofread before presenting the story. These participants stated that using email improved their ability to utilise the target items appropriately, and claimed that they did not study sufficiently concerning the stages of writing the six items in a story format in the class; nevertheless, the focus in class was on the final story and not on the stages of writing. Moreover, one participant stated ‘while I had to write in class, I began to write directly without planning, drafting and even revising’; she believed that this was ‘because of the time’.

Based on these points of view, it can be seen that the participants perceived some advantages of using email to write a story using the six given items, which they felt was enhanced by implementing the stages of planning, drafting, editing and presenting or producing.

5.6.2 Improving learner motivation

Analysis of the open-ended questionnaire data revealed that 32 participants saw using email to learn vocabulary by writing a story encouraged them to learn more. For example, one of the participants stated that engaging in the email activity by email “assisted me to increase my motivation in writing vocabulary efficiently”. These participants also observed that they were excited about completing the activity via email. As one of the participants said, “When I got my feedback from the teacher by email, it encouraged me to correct and read the feedback in my own time”. Another believed that completing the activity via email was a motivating factor. Yet another participant stated:

I utilised it to write some vocabulary in paragraphs to the teacher via email, and I preferred receiving feedback from in word format to get clear feedback because I do not understand feedback some teachers by written hand due to it is not clear not like the feedback on word format with clear written. I believe it is essential to increase my motivation writing on word document by email. (Code: 12) (Translated from Arabic)

Based on these viewpoints, it is clear that most participants were more motivated to complete their writing activities via email than they were when using pen and paper, and the use of email increased students' motivation to learn vocabulary.

5.6.3 Self-taught learning

Analysing the data revealed that 18 students believed that using email to complete the activity was an excellent way to encourage participants' self-taught learning, as they studied independently outside the classroom to use the six vocabulary items to write a story, which they then sent to the teacher.

Although three of the participants expressed the view that, after the first week of the intervention, they still had some problems writing documents in Word and sending them via email. But they began to learn how to write in Word and sending emails individually. A total of 27 participants agreed with this latter point of view, with one saying:

I discovered how to send an email to the teacher one day without asking the teacher and without any help, and I believe that self-learning can help me to build my knowledge and help me to edit my writing, with feedback from my teacher. (Code: 29) (Translated from Arabic)

In this regard, 28 of the participants reported that using email rather than a pen and paper could increase their self-confidence. They contended that they felt a sense of freedom when using email instead of a pen and paper. For example, five participants stated that they liked being able to use email at any time without feeling under pressure; moreover, they said they could spend

more time on their writing. They held that using email decreased writing anxiety because there was no time limit for completing their tasks, compared to the classic technique of writing using a pen and paper.

According to the experiences and attitudes of these students, a majority of the participants agreed that email was a helpful means of boosting their learning, which improved their vocabulary in writing and gave them self-confidence.

5.6.4 Saving answers online

The data showed that 18 participants felt that a positive aspect of using email was saving answers online. One participant explained that she wrote a story each week using the six words provided and saved the activity in her email. After receiving feedback from the teacher, which she also stored in her email, she was able to use the feedback and look at her answers anytime and anywhere, rather than having to search through printed papers, which can get lost.

One participant said that learning vocabulary by using the six items in a story format made it easy “to keep all answers and feedback in one place so I can revise the final exam if these answers come in the final exam, and this also gave me an opportunity to look at my stage of feedback for all the five activities for five weeks”.

5.7 Difficulties Experienced by the Participants in Adapting to the Use of Email

Analysis of the open-ended questionnaire data indicated that the learners experienced some difficulties using email, such as technical problems and a lack of opportunities to practice handwriting. The next section explains these problems in more detail.

5.7.1 Technical difficulties

Four participants explained that they experienced problems connecting to the Internet during the first two weeks of the intervention due to poor connectivity in the area in which they lived. They noted that one of the problems of using email was the requirement for a good internet connection. One participant mentioned another issue, which was that her device was broken, and she sent her answer to her teacher one day without thinking about and revising it. This view was confirmed by another participant who did not have an internet connection at home, and needed to go to her sister’s house to complete her activity and email it to the teacher.

Therefore, more than one participant discussed how a lack of internet access was a problem

for an email activity. The use of email requires good internet connectivity, and some participants considered this to be one of the drawbacks of the intervention.

5.7.2 Lack of opportunities to practise their handwriting

According to the open-ended questionnaire, two participants felt that using email could adversely impact their handwriting due to using a keyboard every day. For example, they stated that using technology (email) was essential and beneficial for learning English, but that writing using this technology could adversely affect their handwriting.

Furthermore, three participants explained that they typed slowly in English, despite the fact that they utilised technologies such as Twitter, Facebook and Instagram, because they only wrote in their mother tongue (Arabic) when using these platforms. However, they benefited from writing numerous emails as they believed this improved their typewriting skills. For example, one of the participants stated that her handwriting was not very good, and she was making mistakes because of this; she thought that writing via email helped her to succeed and to avoid her instructor's criticisms of her handwriting.

According to the above experience, it appears that the previous participant felt ashamed of her poor handwriting using a pen and paper for written English assignments. Nevertheless, she viewed writing in a Word document that is then sent via email positively as she could avoid her instructor's criticisms and at the same time improve her typewriting skills in English.

5.8 A Qualitative Analysis Linking the Questionnaire Results to the Test Scores for the Productive and VKS Test.

The tests scores for the productive and the VKS tests confirmed that the participants who completed exercises using pushed output via email had higher scores. This was confirmed in the questionnaire that asked about participants' experiences of using email. Qualitative analysis of the relationship between the questionnaire data, as well as the experimental data (the test scores for the productive and the VKS tests) confirmed that using pushed email was beneficial for learning vocabulary in the short and long terms. Moreover, the results of the effect-size analysis of the VKS test confirmed that using pushed email was beneficial for learning vocabulary in the short and long terms. This is consistent with what the participants mentioned in the questionnaire, as the quantitative results in Section A of the questionnaire confirmed the students' positive attitudes towards the use of email for learning vocabulary. In Section B of the questionnaire, the participants confirmed that using email to learn vocabulary was important because

they had previously experienced problems increasing their vocabulary. In this regard, the participants explained that the technology played a positive role in their studies of English and that they were dissatisfied with the traditional methods usually utilised for teaching the subject. The participants thought that traditional methods were insufficient and that combining them with email could make them more useful for improving their learning. The intervention provided the learners with a sense of freedom when writing in English, exposure to various writing techniques, and more flexible instructor feedback. The open-ended questionnaire's results demonstrated that the majority of the participants understood the advantages and confirmed the significance of using email to learn English vocabulary.

5.9 Conclusion

This chapter has presented the study's results, which considered three conditions (pushed output in the class, pushed email and non-pushed class) in three groups comprising 54 participants in total. It began with an analysis of the productive tests by discussing the analyses of the pre-tests, post-tests and delayed post-tests, the gain scores in the pre-testing to post-testing stages, and the gain scores in the pre-testing to delayed post-testing stages, followed by a discussion of the effect sizes. The results of effect size analysis of the productive test confirmed that using pushed email was beneficial for learning vocabulary in the short and long terms.

Secondly, the chapter has analysed the VKS test of the pre-test, the post-test and the delayed post-test, as well as the gain scores for the pre-testing and post-testing stages and the gain scores for the pre-testing to delayed post-testing stages, followed by a discussion of the effect sizes. The results of the effect size analysis of the VKS test confirmed that using pushed email was beneficial for learning vocabulary in the short and long terms.

Thirdly, the chapter provides a comparative analysis of student writing samples, including a quantitative analysis of vocabulary size and a qualitative analysis of lexical errors in student writing. Fourthly, this chapter has presented an analysis of the questionnaire, beginning with its reliability and followed by analyses of the scale regarding students' attitudes and experiences towards email in Section A. The quantitative results in Section A confirmed the students' positive attitudes towards using email for learning vocabulary, but these results indicated that many questions remain to be answered; therefore, Section B's qualitative element was important in order to extend these results by evaluating precisely how the participants felt about the advantages and disadvantages of the intervention for learning vocabulary. Thus, section B consisted of open-ended questions. A detailed discussion of these issues is found in Chapter 6, which also links the results of the current research with chapters two and three.

Chapter 6. Discussion

6.1 Introduction to the Chapter

This study considers how three conditions - pushed email, pushed class, and non-pushed class - assist learning vocabulary. It was hypothesised that pushed email would assist in the learning of vocabulary. As demonstrated in the previous chapters, the pushed output hypothesis and associated technology, and the relationship between them for learning vocabulary, form the theoretical framework for the current research.

The significant problems that this research has raised concern the impact of using email for pushed output for learning vocabulary, via productive and VKS tests, and the advantages and disadvantages of the use of email, using a questionnaire that examined students' attitudes and experiences.

Discussion of the main findings and their importance addresses the two main research questions: To recap, the first main research question is:

Is there a difference in the vocabulary used in the short and long terms through participation in a non-pushed output class and a pushed output class?

This first main question assesses the significance of pushed output when students use English vocabulary for writing in terms of gain scores for pre-and post-tests in the short term and pre-and delayed post-tests in the long term and the use of target vocabulary at different time points. This first main question has two sub-questions. The first sub-question is: Is there a difference between the use of pushed output using email for students' vocabulary skills and participation in a pushed output class without email in the short and long terms? This first sub-question evaluates the role of pushed email and its contribution to language use in terms of gain scores for pre-and post-tests in the short term and gain scores for pre-and delayed post-tests in the long term regarding writing skills and the use of target vocabulary at various timepoints. The second sub-question is: Do the combined effects of email and pushed output provide additional improvements to students' vocabulary skills over the short and long terms? This question evaluates the effect of email when supporting and enhancing the process of pushed output. It also determines its contribution to language learning in terms of gain scores for pre-and post-tests in the short term and pre-and delayed post-tests in the long term. It is not easy to measure this question, but the effect size was used to calculate the analyses of RQs 1 and 1a (to determine if pushed output and email have better results than expected) to answer this question.

To recap, the second main research question is:

What are students' experiences of and attitudes toward studying vocabulary using email as part of a technology enhanced learning approach to use vocabulary?

This question explores students' experiences of and attitudes towards learning vocabulary using email as part of a technology-enhanced learning approach to use vocabulary.

Using a mixed-methods approach, the first main research question and its sub-questions were addressed. The quantitative component consisted of evaluating the test results of productive and VKS assessments and conducting a quantitative analysis of the vocabulary size of the students' writing. In addition, a qualitative analysis of lexical errors was conducted, concentrating on two dimensions: lexical choice and lexical form.

Concerning the second main research question, both quantitative and qualitative data were collected via a questionnaire containing Likert scales and open ended questions. This data were used to determine whether the participants' perspectives aligned with the test results. This integrated methodology allowed for a thorough examination of the research questions and yielded valuable insights into the relationships between vocabulary use, test achievements, and participant perspectives.

This chapter addresses the following hypotheses: Firstly, hypothesis 1 states that a statistically significant difference exists among the gain scores of pre-testing and post-testing of students who have completed participation in a pushed class and students who have completed participation in a non-pushed class. Secondly, hypothesis 2 states that a statistically significant difference exists between the gain scores of pre-testing and post-testing of students who have completed participation using pushed email and students who have completed participation in a pushed class without email. Thirdly, hypothesis 3 states that there is a statistical benefit in terms of effect size between the gain scores of students' pre-tests and post-tests when using a combination of email and pushed output compared with students only studying in a pushed output class. In terms of delayed post-tests for these three hypotheses, there is a significant difference between the gain scores of pre-testing and delayed post-testing, considering that students' long-term retention of vocabulary is used as a measure for retained knowledge (Shafaei & Abdul Rahim, 2015; Amin & Mojavezi, 2017), and the delayed post-tests demonstrated a favourable outcome for students' vocabulary retention (Altalhab, 2018).

Fourthly, hypothesis 4 posited a considerable difference between the vocabulary size of students who have participated in a pushed email condition and those who have participated in a pushed class or non-pushed class condition. Fifthly, hypothesis 5 held that, over time, there is a significant improvement in the lexical choices and forms of students exposed to pushed email, pushed class, or non-pushed class conditions. Sixthly, hypothesis 6 held that students' experiences with and attitudes towards studying vocabulary via email as part of a technology-enhanced learning strategy to use vocabulary are positive.

6.2 Pushed Output in Learning Vocabulary

The question related to pushed output evaluated its importance for learning English vocabulary in terms of gain scores for pre- and post-tests in the short term as well as pre- and delayed post-tests in the long term. The goal of this section is to state what the results of the research mean for the initial hypotheses and research questions.

A possible criticism is that pushed output theory is old, based on Swain's (1985) work. However, older theories can become of greater importance when they are validated. An example would be Lev Vygotsky's theory of social learning (addressed later in this chapter), and the importance of communication in learning, which was developed in the 1920's and 1930's. Research has continued to support his theory and promote further investigation of it.

Similarly, pushed output theory can only remain relevant where research shows it works. Beniss and Bazzaz (2014) conducted a study to establish quantitative baseline data on the effect of pushed output on two aspects of speaking: accuracy and fluency. The conclusions of this Iranian based study were that the students in the experimental group, who received pushed output treatment, outperformed the control group in accuracy. This 2014 study helped prove the validity of pushed output work in EAL today.

Any educational research should seek to support the learner, and in EAL there was a promise that accuracy and fluency would be developed as a goal for teaching and learning EAL, but it did not happen because the pushed output is defended as a method and evidenced by the research studies (Richards, 2008). It, therefore, becomes important to look at how EAL can match learning goals, and if pushed output theory can deliver results, then it is worthwhile researching. According to research conducted in 2020, one-way pushed output activities allow students to modify their oral output more than two-way activities (Lopez, 2020). With research validating, at least in part, the role of pushed output then the modern research is adding to existing knowledge and building up the work of Swain (Swain, 1985).

If it is possible to match for the student the best language form for conveying intended meaning, to be able to match speaking practice to oral production (for example), then Hall (2016) suggests that research still has much to contribute. Part of that research is to see whether pushed output retains validity; does production help learners test hypotheses about the target language for example? Hall (2016) considers that both comprehension and pushed output practice require research to see whether there can be a cross-fertilization between the two. Research cannot be academic only; it has to transmit back into the classroom, or learning environment. Alongside this research there remain academics very interested in research findings on its continued use.

The research questions, and the hypothesis for each one, directly connect to the literature review, and the research already undertaken that has looked at the strengths and weaknesses of pushed output. Aside from the benefits to instruction, there is research evidence that the learners also see “the unique benefits of writing in terms of pushed output, both for language growth and the growth of disciplinary knowledge as well” (Hirvela, 2018, p.54). Hirvela (2018) states that there is no benefit to language learning if the learner is unclear how they will use the learning outside the classroom. Furthermore, the learners must be exposed to ‘meaningful and comprehensible input (Hirvela, 2018, p.41). This desire leads to the first research question and the differences in participation, how language is learned and (most importantly) used.

To recap, the first research question is:

Is there a difference in the vocabulary used in the short and long terms through participation in a non-pushed output class and a pushed output class?

(Hypothesis 1: There is a statistically significant difference between the gain scores of pre-testing and post-testing of students who participated in a pushed class and students who participated in a non-pushed class).

To address this question, there are two methods to consider. In this section, the first method consists of a productive test and a VKS test. The second method is to examine the vocabulary use of the target vocabulary. This will be done through a quantitative analysis of the vocabulary size of the students' writing and a qualitative analysis of lexical errors, concentrating on two dimensions: lexical choice and lexical form. In section 6.5, where a comparative analysis of student writing samples will be conducted, these analyses will be presented. For the short term, gain scores from pre testing to post-testing were used, and for the long term, gain scores from pre-testing to delayed post-testing were used. The pushed class was more beneficial than the non-pushed class in both the productive test and the VKS test in both the short and the

long terms.

- Short term productive test scores in the pushed class were better than in the non-pushed class, with an effect size $r^2 = 0.19$, $p < .05$.
- Long term productive outcomes in the pushed class were higher than in the non-pushed class, with an effect size of $r^2 = 0.18$, $p < .05$.
- Short-term vocabulary knowledge scales scores in the pushed class were higher than in the non-pushed class, with an effect size of $r^2 = 0.10$, $p < .05$.
- Long-term vocabulary knowledge scales results in the pushed class were better than in the non-pushed class, with an effect size of $r^2 = 0.10$, $p < .05$.

These results show that the learners who did exercises via pushed output performed better at learning vocabulary than learners who did exercises without pushed output in both the short and long terms. To clarify the focus of the work, a distinction between pushed and non-pushed output needs to be recapped here. Non-pushed output is where the student is asked to produce a sentence or response, and either a direct correction is made, removing the potential for the student to reflect on and self-correct the error, or no correction is made, which means the student is not directed to the correct production. Pushed output, in contrast, is focused on using strategies to encourage the student to notice where and when they have made an error, reflect on this error and self-correct (Swain, 1985, 1993; Byrne and Jones, 2014). Reviewing these differences, it could be said that pushed output has a stronger potential to improve overall skills in language due to the focus on encouraging learner self-awareness of errors and self-correction.

The value of pushed output, therefore, is that it encourages reflection on what has been input because, as Ellis (2003) noted, pushed output is a reflection of what learners are able to produce when pushed to use the TL concisely and accurately. The results build closely from changing communicative methodologies, in which there was a past history of promises (in language pedagogy) to develop fluency and accuracy as an objective for English language teaching internationally. Theoretically, language and cognition were explored by educational psychologist Lev Vygotsky (1896-1934), who showed the fundamental importance of social interaction within the development of cognition (Vygotsky, 1978). In this regard, Vygotsky places social interaction and learning before cognition, making the place of the verbal (or written) reflective process an essential element of learning. The theories in my study contribute to the fact that the social and cultural contexts of learning highlighted by Vygotsky (1978) are both connected via the encouragement of learner self-awareness and self-correction.

For the purposes of the current study, pushed output is defined as when learners are ‘pushed’ to participate in production, they take the opportunity to produce answers that are accurate, concrete, appropriate and precise (Swain, 1985). Beginning with the short term from pre-testing to post-testing in terms of the VKS and productive tests, the findings confirm that the short-term productive test scores in the pushed class were higher than in the non-pushed class, and the short-term VKS test scores in the pushed class were higher than in the non-pushed class.

Looking at recent, comparable, tests, Lopez (2020) researched EFL students at a private school in Colombia, South America. Naturally, a different setting and participant group means that there are limitations in making cross comparisons between research groups. Vygotsky (1978) claimed that cognitive development varies across cultures, so there are differences in how the research is formed. However, Lopez (2020) undertook to have an output and non-output group, with the output group receiving five weeks of oral pushed output activity and the non-output group receiving only comprehension activities. Lopez’s (2020) results showed that by pushing students to produce meaningful oral delivery there was an improved modification in their oral output. Furthermore, “students perceived oral pushed output as an affectivity regulator in L2 oral production that authorised them to obtain habituated and as a trigger of exposure to L2 vocabulary, grammar, and pronunciation” (Lopez, 2020, p.86).

Concerning the practical features of learning English, particularly in Saudi Arabia, one problem is that the curriculum is heavily instructor-oriented. This runs against Vygotsky’s (1978) principle of interactive, social learning. This problem impacts the method of learning in various ways. One is that these traditional methods of learning writing and learning vocabulary might limit learners' opportunities to communicate in the classroom. In Saudi Arabia, learning English is still taught in a traditional way and is very much instructor centred. Learning vocabulary using the pushed output design, by contrast, pushes learners to be active in using given words in a format story and then receiving feedback from the teacher.

A second issue is that the assistance systems and educational policies in Saudi Arabia are not adequate in terms of utilising educational technologies in universities (Bingimlas, 2009).

Lastly, another issue for effective English vocabulary learning is the large class sizes. English instructors themselves experience the hard reality that several Saudi English major students accepted in Saudi universities (after leaving secondary school) lack an adequate understanding of procedures to produce satisfactory writing texts and have insufficient general knowledge of English (Almalki, 2019), attributable partly to the large class sizes in which they study in high

school. As a result, large size classes adversely impact the education process. For instance, learners have less individual time to practice writing and, moreover, receive limited instructor feedback. Moreover, well-established utilisations of technology might be lacking: for instance, using technology with pushed output to reflect on answers and produce writing concisely and accurately requires time. One of the advantages of pushed output using email is that it can overcome limitations of time and space by empowering the learner to study whenever and wherever is most suitable for them (Howard and Scott, 2017). If Saudi universities would like to develop learning methods, particularly in learning English vocabulary in writing, teachers should combine traditional methods with pushed output using email for home assignments

Continuing to compare these findings with the findings of the relevant literature which has investigated learning English via the pushed output hypothesis in the short term, the current study concurs with De la Fuente (2002), who found in post-tests (in the short term) that L2 intermediate learners asked to produce output outperformed students who were asked to do only input on productive vocabulary tests. However, this study focused on Spanish learners acquiring the meaning of nouns, in contrast to the current study's focus on English learners learning abstract nouns and verbs to build a story (Pandey, 2015). Tomasello (1992) stated that verbs are an essential part of speech because they lead to the development of complete sentences. Similarly, Karamibekr and Ghorbani (2012) noted that verbs are essential for learning language because they allow learners to begin building sentences, and every utterance demands a verb. The choice of verb defines many grammatical forms in any sentence. Abstract nouns illustrate qualities and concepts that are not perceivable via the senses. According to Bird, Franklin and Howard (2001), abstract nouns are acquired at the same time as verbs, since the latter are conceptual instead of tangible.

In essence, encouraging output appears to have a beneficial effect on vocabulary learning, underlining the potential value of a pushed output approach. Therefore, students could learn their English vocabulary via pushed output by writing a story in story format and then receiving feedback from their teacher. This comparison was conducted in order to draw out the second comparison between pushed output and technology such as pushed email; indeed, this is the main research gap this study aims to fill, as discussed in the following sections.

Other studies support the pushed output hypothesis, but they focus on listening, speaking and reading (Hazrat & Hessamy, 2013; Beniss & Bazzaz, 2014; Namaziandost, Nasri & Ahmadi, 2019), in contrast to the current study's focus on writing. Hazrat and Hessamy (2013) supported the role of pushed output and showed that intermediate Iranian women L2 learners studying

vocabulary using oral pushed output effectively promoted listening knowledge and active lexical items learning compared to studying lexical items using written pushed output.

Beniss and Bazzaz (2014) supported the role of pushed output in terms of speaking accuracy, finding that thirty female L2 students in a pushed output instruction group performed better than students in a non-pushed output treatment group in terms of accuracy. Furthermore, Nama-ziandest, Nasri and Ahmadi (2019) supported general pushed output in their demonstration that 50 male pre-intermediate learners' instruction in pushed output improved their reading comprehension. Mahmoudabadi et al. (2015) supported the impact of pushed output by showing how vocabulary was improved by L2 students. They found that 103 female Iranian L2 students doing vocabulary activities in an output-input group and input-output group had better outcomes than learners in an input-only group. In a study by Al-Ghazo and Taamneh (2017) in Jordan, the outcomes showed that experimental group results were remarkably better than in the control group in post-testing.

These outcomes confirm that teaching based on the pushed output hypothesis successfully improved learners' performance. The current study concurs with those that have argued for the beneficial effects of pushed output. The study hypothesised a statistically significant difference between the gain scores of pre-testing and post-testing of students who completed participation in a pushed class and students who completed participation in a non-pushed class. The study adopted a mixed methods approach to explore whether or not English major undergraduates learning English vocabulary and writing skills in the Middle East performed better in exercises via pushed output than learners doing non-pushed output activities. The results reveal that learners learn vocabulary via pushed output activities more effectively because producing given words in story format is useful for sustaining the prolonged practice of writing vocabulary and thus, crucially, thinking in English. This was the case in the short and long terms, concurring with Roediger and Karpicke (2006), who stated that the influence of the testing effect suggests that long-term retention of knowledge is increased when there is testing during the learning process and effective feedback is provided. The current study's delayed post-test to measure vocabulary retention also revealed that the students who did pushed output activities performed better than students who did non-pushed output activities.

With regard to the long term from pre-testing to delayed post testing in terms of the VKS and productive tests, the current study concurs with Laufer and Hulstijn (2001) and Nation and Webb (2011), who also found that research on learning with long-term memory presented particular issues. By meeting educational needs, encountering new information, and recognising

suitable options, we can propose that language students successfully utilise the lexical items that they are learning. In the current thesis, with regard to the long term from pre-testing to delayed post testing, it was hypothesised that those students who did exercises in the pushed class would have better retention of vocabulary knowledge compared to those doing exercises in the non-pushed class. Indeed, the findings reveal a significant difference between them, with the pushed class outperforming the non-pushed class. Hence immediate and delayed post-testing confirmed the importance of pushed output methods.

Some existing studies reviewed in the current study have shown that pushed-output seems to lead to improved results in vocabulary learning. Some studies have focused on pushed output in learning vocabulary, as noted, but the contribution of the current study is that its mixed methods research focuses on intermediate level English major undergraduates over the short and long terms, a gap existing in existing research in the field. The next sections show how the current study fills another gap in the existing research.

6.3 Technology in Learning Vocabulary

In this section, the results from the productive and VKS tests, analysed in Chapter 5, are recapped here to respond to the first sub-question of the first main research question and the second hypothesis. This question drives an evaluation of the role of pushed email and its contribution to language learning in terms of the gain scores for pre- and post-tests in the short term and pre- and delayed post-tests in the long term.

To recap, sub-question 1 of the first main research question is:

Is there a difference among the use of pushed output using email for students' vocabulary skills and participation in a pushed output class without email in the short and long term?

(Hypothesis 2: There is a statistically substantial difference between the gain scores of the pre- and post-tests of students who completed participation in a pushed email class and students who completed participation in a pushed class without email).

The previous section discussed the first comparison, and this section discusses the second comparison (context), namely, a pushed email class versus a pushed output class without email. Let us thus begin with the second comparison.

Regarding this research question, there are two methods to consider. The first procedure in this section is comprised of a productive test and a VKS test. The second technique involves analysing the vocabulary usage of the target vocabulary. This will be accomplished through a quantitative analysis of the vocabulary size of student writings and a qualitative analysis of lexical errors, focusing on two dimensions: lexical choice and lexical form. These analyses will be presented in Section 6.5, where a comparative analysis of student writing samples will be conducted. In terms of the short term, I used the gain scores from pre-testing to post-testing, and for the long term I used the gain scores from pre-testing to delayed post-testing. The pushed email condition performed better in both the productive test and the VKS test in both the short and the long terms than the pushed class.

- Short term productive test scores in the pushed email were better than in the pushed class, with an effect size $r^2 = 0.26$, $p < .05$.
- The pushed email's long-term productive results were higher than in a pushed class, with an effect size of $r^2 = 0.20$, $p < .05$.
- Short term vocabulary knowledge scales score in the pushed email was more significant than in the pushed class, with an effect size of $r^2 = 0.73$, $p < .05$.
- Long term vocabulary knowledge scales result in the pushed email were better than in the pushed class, with an effect size of $r^2 = 0.72$, $p < .05$.

These findings suggest that learners who did exercises via pushed email were more effective at learning vocabulary than learners who did exercises in a pushed class without email in the short and long terms. In terms of the productive test, particularly the second comparison (context) between the pushed email class versus the pushed output class, I found that the former generated higher gain scores than the latter in the short term, which means the gain scores from pre-testing to post-testing, and in the long term, which means the gain scores from pre-testing to delayed post-testing.

In terms of the VKS test, particularly the second comparison (context) between pushed email versus pushed output, I found that the pushed email condition had higher gain scores than the pushed class condition in the short term, meaning the gain scores from pre-testing to post-testing, and in the long term, which means the gain scores from pre-testing to delayed post-testing.

According to the literature review, several studies have analysed in depth the educational utilisation of technology for learning vocabulary (see, for example, recent reviews in Uzunboylu et al, 2015; Aw et al, 2015; Stockwell & Liu, 2015; Wong & Looi, 2010; Zhang, et al, 2011;

Saran, et al, 2012). These studies' findings are similar to those of the current study in determining that technology is helpful for learning vocabulary, exposing students to lexical items' spaced repetition, which is seen as being more efficient than a merely high level of repetition. Comparative analysis of the effect of learning vocabulary via email.

Another study, by Song and Fox (2008), found that utilising short messaging services and the internet for learning vocabulary improved the learning of lexical items. These findings were confirmed in later work by Hsu (2015). These studies are supported by the current study, which illustrates that learners who did exercises via pushed email were more effective at learning vocabulary than learners who did exercises in a pushed class without email. Moreover, the indication from the early work of Cavus and Ibrahim (2009), as well as Basoglu and Akdemir (2010), subsequently confirmed by Stockwell and Liu (2015), appears to be that whether the engagement with technology is inside or outside the classroom, positive effects on vocabulary knowledge are still identifiable. This suggests that use of the medium of email may contribute to enhanced efficiency among students, particularly those who may not have previously been motivated to engage in autonomous, self-regulated learning (Zhang et al., 2011). In other words, the enhanced engagement with learning due to enjoyment of engagement with online mediums contributes to a more positive and focused learning experience for students.

But the current research fills a context gap in Saudi Arabia with regard to technology and ESL pedagogy in the KSA by applying a mixed methods approach to compare the effects of technology on learning English vocabulary, particularly specifically for English major intermediate undergraduates at a Saudi university in the short and long terms. The research also aspires to fill another gap which became evident with the Covid-19 pandemic. This gap is particularly noticeable in the UK, where, both in schools and in language centres, ESL provision has been expanding due to the large number of second language learners arriving (pre-Brexit) from Eastern Europe, Iraq and Afghanistan. Teaching was dramatically impacted by the Covid pandemic, which led to online teaching using such applications as email and Zoom. Therefore, research on the impact of technology on EAL pedagogy suddenly became of great import not only in the KSA, but also worldwide.

Although some US and Latin American studies (such as the aforementioned work by Lopez, 2020), gaps exist in this area in the UK. Only one research paper has come close to looking at this area, namely the Arnot et al (2014) paper which was written for the Refugee Council. However, this paper was school-based and more about in-school EAL pedagogy, and although it did feature incorporating technology into teaching, it was not specifically about pushed learning.

With regard to the KSA, only one study would be considered similar in terms of data collection, namely that of Al-Ahdal and Alharbi (2021). However, their study focused on collaboration as group activities instead of the individual activities focus of the current study. Moreover, Al-Ahdal and Alharbi (2021) focused on the short term only, i.e. from pre-testing to post-testing. Nevertheless, the current study supports Al-Ahdal and Alharbi (2021) in that their three-month study focused on developing critical knowledge applications for 80 mixed gender English undergraduates at two Saudi universities. Using a mixed methods approach, the study revealed enriched vocabulary memory in pre- and post-test outcomes across the two genders.

As is observed from the current study outcomes that the difference between short-term memory (gain scores from pre-testing to post-testing) and long-term memory (gain scores from pre-testing to delayed post-testing) in two settings which were pushed email versus pushed class in both tests, productive test and vocabulary knowledge scales test and I found that students who were doing exercises via pushed email were higher than students who doing pushed class in the short term and long term of vocabulary knowledge scale test and it was a close effect size where the short term is $r^2 .73$, and long term is $r^2 .72$ and these effect sizes considered a large effect size as Cohen (1988) stated that. This means that students keep their vocabulary memory from posttest to delayed posttest and the difference was only 0.01, and it is a small difference. In terms of productive test, students who were doing exercises via pushed email were higher than students who were doing the pushed class in the short term, and long term of productive test and the difference between short and long term is students in terms of the short term were higher than long term 0.26 compared to 0.20 but although this effect size is still large size for both. As I argue from the outcomes of the current study, that students can keep their vocabulary for longer when using the technology in learning English vocabulary where the effect size of long term is still large effect size.

It would seem that language support during the integration stage can lead to more rapid integration of the cognitive processes required to deliver accurate output. In the context of technology, there may be a role for it to facilitate this process due to the asynchronous and informal nature of the mediums, as well as other factors, and it is confirmed in this section that the participants of the current study learned a large amount from pushed email (technology) compared to the pushed class without technology. As such, consideration of CALL and how it can assist in pushed output is required.

6.4 Pushed Output and Technology in Learning Vocabulary

In this section, the results from the productive test and the VKS test, analysed in Chapter 5, are summarised here in response to the second sub-question of the first main research question and the third hypothesis (see below). This question evaluated the effects of email when supporting and enhancing the process of pushed output. It also determined its contribution to language learning in terms of gain scores for pre- and post-tests in the short term and pre- and delayed post-tests in the long term. It is difficult to measure this question, but the effect size used to calculate the analyses of RQs 1 and 1a (to determine if the effects of pushed output and email are greater than expected) in order to answer the second sub-question of the first main research question.

To recap, the second sub-question of the first research question is:

Does the use of effects of email and pushed output provide additional improvement to student vocabulary skills over the short and long term?

(Hypothesis 3: There is a statistical benefit of effect size between gain scores of students pre- and post-testing when using email and pushed output as compared to students only studying pushed output in class).

The previous two sections considered the first and second comparisons - a pushed class versus a non-pushed class and pushed email versus a pushed class - to answer the first main research question and the first sub-question of the first main research question. This section seeks to answer the second sub-question of the first main research question. Using the calculating effect size, a statistical benefit was identified for both comparisons (pushed class versus non-pushed class and pushed email versus pushed class), in line with the hypothesis. In addition, whether the email and pushed output had further benefits over and above the same method in the classroom was investigated. After the two comparisons above confirmed the hypotheses in the results chapter, the effect size was used to determine whether the size effect of pushed email was greater than expected compared to that of the pushed class, answering the sub-question of the first main research question.

In terms of the productive test, particularly the effect size of the two comparisons, the current research found that the largest effect size for the gain scores across the short and long terms was for the pushed email class versus the pushed class. For the short term (pre-test to post-test), it was revealed that the pushed email class had a greater effect size than the pushed class; this means that the students who completed their exercises via email outside the class using pushed

output experienced a greater effect size than the students who were engaged in pushed output in the classroom. For the long term, from the pre-test to the delayed post-test, it was revealed that the pushed email class had a greater effect size than the pushed class; although both effects were medium sized, the pushed email class received a score of .20, compared to .18 for the pushed class.

In terms of the VKS test, particularly the effect size of the two comparisons, SPSS analysis revealed that the pushed email condition had higher gain scores than the pushed class condition in the short term, which refers to the gain scores from pre-testing to post-testing, and in the long term as well, which refers to the gain scores from pre-testing to delayed post-testing.

The short term (pre-test to post-test) revealed that pushed email had a more significant effect than the pushed class, indicating that students who engaged in activities via email outside the class using pushed output had a higher effect size than students who engaged in pushed output in the class.

With regard to the long period, from pre-testing to delayed post-testing, pushed email obtained a greater size effect than that of the pushed class. In other words, students who completed their exercises via email outside the class utilising pushed output had a higher effect size than students who engaged in pushed output in the class.

As noted in the literature review, de la Fuente (2003) supported pushed output in a study which explored English native speakers learning elementary Spanish in an intact second semester class. Nevertheless, Computer-Mediated Communication (Virtual Chat in Blackboard) negotiated interaction appears to have been less useful for improving oral skills in a second language, particularly if it improves the productive end of vocabulary learning. De la Fuente's (2003) research found that learners who were asked to produce output outperformed those students who were involved in input alone on productive vocabulary tests. She advised that the deeper processing involved in output led to higher gains for these students in terms of the negotiation method promoting second language vocabulary improvement through Computer-Mediated Communication and synchronous interactive activities. The difference between the current study and Fuente et al.'s (2003) study is that the former focuses on English learners while Fuente et al.'s (2003) research was with Spanish learners. Moreover, De la Fuente's (2003) study focused on students' interactions with each other, but the current study focuses on interaction between student and teacher only.

The literature review revealed that a number of studies have examined the technology-enhanced effects of digital based activities inside and outside the classroom and explored the impact of the learning environment for learning vocabulary. Alsaleem's (2013) investigation in Saudi Arabia explored how technology, specifically WhatsApp, helped students develop their vocabulary item choices in writing. Her results illustrated a significant difference between pre-test and post-test scores, finding that technological tools appear to help learners develop their vocabulary through writing. Although there are overlaps between the current study and Alsaleem's (2013) research, the former fills a specific gap in that it combines vocabulary and pushed output via technology (email) and is focused on adult learners. The current study found that the students improved their vocabulary via technology (email) with pushed output in the short term in terms of a productive test and a VKS test. Unlike Alsaleem's (2013) study, the current research investigated the long term and found a significant difference in that students doing pushed output exercises via email outperformed students doing pushed output exercises without technology. Except for de la Fuente (2003), the wide body of research into English learners has not focused on pushed output and technology combined with vocabulary. However, as noted, that study focused on Spanish learners, although both areas of previous studies have been examined independently (Razak et al, 2013; Alsaleem, 2013; Allagui, 2014). These studies concur with the results of the current study.

For the long term, from pre-testing to delayed post-testing, the current study focuses on a psycholinguistic approach, recognising the role of the mental lexicon in vocabulary learning. This construct refers to the mental storage involved when language is used, and contains the words, associations and meanings that a person makes with regard to specific lexical items (Richards & Schmidt, 2002). The approach examines what role the medium of email plays in enhancing the retention of vocabulary. This is based on the mental lexicon and its recognition of the mechanisms by which languages are processed and represented in the brain.

De la Fuente's (2003) study aligned with the notion that deeper processing can be achieved with technology (Virtual Chat in Blackboard) over different mental lexicon stages. In effect, the suggestion is that the pushing of responses via email may encourage students to access their mental lexicon (storage of words and usage) to enable accurate language output or reflection and amendment of initial responses. The current study finds that the pushed email condition in the long term has a similar sized effect to the short term in terms of the VKS test, at .73 compared to .72 respectively.

In several studies (such as Roediger & Marsh, 2005) on the testing effect, learners have studied several materials and later taken a pre-test and then a delayed-test with the same questions (that is to say: cues) and then been asked to retrieve the same utterances (targets). Some studies which have use this method (e.g. Roediger & Butler 2011; Keresztes et al., 2013) have illustrated that this testing system promotes retention through intervals, implying that memory of the retrieved information is strengthened.

However, influence of the testing effect suggests that long-term retention of knowledge is increased when there is testing during the learning process and effective feedback is provided (Roediger & Karpicke, 2006). For the current work, with the students' completing pushed output activities, either via email or in class, the participants received six items weekly and were required to produce them in story format and return their work to the teacher. They received feedback over five weeks and then received the post-test after the treatment, and five weeks later they did a delayed post-test, as consistent with previous studies on the importance of the testing effect.

It has been discovered that writing stories has several advantages over sentence construction. One study found that discourse knowledge, which includes knowledge about narrative elements and motivation, substantially contributed to the quality, length, and vocabulary diversity of stories (Olinghouse & Graham, 2009). This suggests that writing stories allows for the use of language that is more complex and diversified than sentence construction alone. In addition, a second study found that instruction in sentence combining, a skill frequently employed in narrative writing, enhanced students' writing performance by enabling them to compose more complex sentences (Saddler & Graham, 2005).

Moreover, it has been demonstrated that encountering words in stories is an effective means of promoting vocabulary development (Wilkinson & Houston-Price, 2012). Children are more likely to acquire and retain the meanings of new words when they are exposed to them in the context of a story. This is especially true when teachers provide dictionary definitions and elucidate on the new words' meanings (Wilkinson & Houston-Price, 2012). Therefore, composing stories not only provides opportunities for sentence construction practise, but also for vocabulary development.

In terms of contrasting the findings regarding the use of vocabulary in narrative writing, it is essential to note that the aforementioned studies concentrated on various aspects of writing. Olinghouse and Graham's (2009) study on discourse knowledge and story quality examined the

relationship between discourse knowledge and the overall quality of stories, including length and vocabulary diversity. A study on vocabulary development conducted by Wilkinson and Houston-Price (2012), on the other hand, concentrated on the efficacy of encountering words in stories for promoting vocabulary learning. While both studies emphasise the benefits of story writing, they focus on distinct aspects of writing and language development.

In conclusion, composing stories has a number of benefits over sentence construction alone. It enables the growth of discourse knowledge, which contributes to the quality, duration, and vocabulary diversity of narratives. Moreover, encountering terms in stories encourages vocabulary growth. These results indicate that story writing not only improves sentence construction skills, but also facilitates the learning of new vocabulary. Incorporating narrative writing activities into language instruction can therefore be advantageous for students' overall language development.

In terms of which suggested reasons might explain the result of the productive test and VKS test using email with pushed output to learn English vocabulary, the next section looks at the students' experiences of and attitudes towards using email with pushed output.

6.5 Comparative Analysis of Student Writing Examples

This section of the study aimed to evaluate the impact of three distinct conditions on vocabulary learning in language learners: pushed output, non-pushed output, and pushed email. The investigation required the collection of 27 writing samples from each participant, with three samples collected in each of weeks 1, 3, and 5, for a total of nine samples per participant. In other words, each student contributed three samples of writing for each condition, totaling nine samples per condition across the 27 scripts. Two methods were used to analyse these writing samples: a quantitative analysis of vocabulary size according to Meara and Miralpeix's (2016) guidelines, and a qualitative analysis of lexical errors based on Engber's (1995) taxonomy, which considers two dimensions: lexical choice and lexical form. The study formulated the following hypotheses:

Hypothesis 4: There is a considerable difference between the vocabulary size of students who have participated in a pushed email condition and those who have participated in a pushed class or non-pushed class condition.

Hypothesis 5: Over time, there is a significant improvement in the lexical choices and forms of students exposed to pushed email, pushed class, or non-pushed class conditions.

Concerning the quantitative analysis, the examination of VS in the 27 writing samples collected from three student groups during weeks 1, 3, and 5 revealed a consistent trend favouring the pushed email condition. The students were required to compose a narrative using six target words and receive instructor feedback via email. The results indicated that the pushed email condition performed better than the other two conditions (pushed output and non-pushed output) in terms of promoting and maintaining vocabulary growth over time. These results support Hypothesis 4, which predicted a statistically significant difference in vocabulary size between students in the pushed email condition and those in the pushed class or non-pushed class conditions. In addition, the purpose of this analysis is to answer the second part of the first sub-question of the first main research question:

Is there a difference among the use of pushed output using email for students' vocabulary skills and participation in a pushed output class without email in the short and long term?

This question evaluates the role of pushed email and its contribution to language use in terms of gain scores for pre- and post-tests in the short term and pre- and delayed post-tests in the long term in terms of writing skills. This first part of this question is answered in section 6.3: 'Technology in Learning Vocabulary,' and this section also addresses the second part, which examines the use of target vocabulary at various time points. Consequently, the findings found pushed email to be the optimal condition for vocabulary use in terms of VS.

This study's findings are consistent with previous research on the benefits of accelerated output and feedback for L2 learning. Swain (1985) defined pushed output as language production that requires learners to extend their linguistic resources beyond their current level of competence. Feedback is the provision of information or correction that enables students to recognise and correct their mistakes (Long, 1996). It has been demonstrated that both promote output and feedback promotes language development by enhancing learners' attention, awareness, and metalinguistic knowledge (Swain & Lapkin, 1995; Lyster & Ranta, 1997; Beniss & Bazzaz, 2014).

Nonetheless, this study suggests that the mode of dissemination of promoted output and feedback may influence their efficacy. The pushed email condition, which involves asynchronous written communication between students and instructors, appeared in this study to have advantages over the other two conditions, which involved synchronous oral communication (pushed output) or traditional teaching methods (non-pushed output) in the classroom. Possible benefits of the pushed email condition include:

- It provides students with more time and opportunities to process input, generate output, and receive feedback, without the stress or anxiety of real-time interaction (Warschauer & Healey, 1998). In addition, the email format may provide students with opportunities for self-correction and revision, contributing to an increase in accuracy (Nazari & Niknejad, 2015).

- It offers students a persistent record of their output and feedback, which they can review and revise at their own pace (Ware & Warschauer, 2006).

- It encourages a more individualised and learner-centred approach to instruction, which can accommodate students' various requirements, preferences, and learning styles (Blake, 2000).

These advantages may explain why, across all three weeks, students in the pushed email condition had larger vocabulary sizes than students in the other two conditions. In addition, the pushed email condition may have a positive impact on students' motivation, attitude, and confidence in learning vocabulary, as suggested by quantitative and qualitative data gathered from Likert scales and an open-ended questionnaire (see sections 5.4, 5.5, 5.6 and 5.7).

This study has provided quantitative evidence that pushed email is an effective condition for L2 vocabulary learning. In addition, the study has highlighted some potential advantages of employing asynchronous written communication as the transmission mode for transmitted output and feedback. The study has both theoretical and practical implications for L2 teaching and learning. It contributes to our understanding of how the interaction between input, output, and feedback facilitates language development. In addition, it suggests some practical ways to incorporate technology into language instruction in order to enhance vocabulary development.

In terms of qualitative analysis, this study's qualitative lexical error analysis casts light on the character of lexical errors made by L2 learners and their language learning progress. Lexical errors, which include both lexical choice and lexical form, are a common and pervasive problem that impacts the precision, clarity, and appropriateness of communication. The taxonomy proposed by Engber (1995) served as the framework for classifying and analysing these errors.

The analysis of lexical form errors associated with verb forms in the writing samples of three students from three distinct groups (pushed class, pushed email, and non-pushed class) revealed some intriguing patterns and distinctions. In weeks 1 and 3 (but not in week 5), students in the pushed class and pushed email conditions committed verb form errors. This indicates that students in these two conditions improved their lexical form accuracy over time, potentially as a consequence of receiving instructor feedback via email or in class. These results

provide support for Hypothesis 5, which predicted that the lexical choices and forms of students exposed to pushed email, pushed class, or non-pushed class conditions would significantly improve over time. In addition, this analysis aims to answer the second part of the first main research question:

Is there a difference in the vocabulary used in short and long terms through participation in non-pushed output classes, or in learning environments with pushed output?

This question assesses whether there is an observable effect of pushed output when using English vocabulary in terms of short-term (from pre-test to post-test) and long-term (from pre-test to delayed post-test) gain scores in writing, compared to a non-pushed class. The answer to this question was presented in section 6.2: 'Pushed output in Learning Vocabulary,' and this section also provided insights into the second method, which examines the target vocabulary's usage at different time points. In terms of vocabulary size, the findings indicate that the pushed class performed better than the non-pushed class for vocabulary use. In contrast to the non-pushed class condition, both pushed class and pushed email are optimal conditions for enhancing lexical choices and forms accuracy over time.

Consistent with previous research on the function of feedback and exposure in L2 learning, these findings support the importance of these factors. Long (1996) defined feedback as any information that helps learners recognise and remedy their errors. Ellis (2008) defined exposure as any input or output that affords learners opportunities to encounter and use the target language. Both feedback and exposure have been shown to promote language development by enhancing learners' attention, awareness, and metalinguistic knowledge (Swain & Lapkin, 1995; Lyster & Ranta, 2001).

The use of various word forms, such as 'classify', 'classification', and 'classified', demonstrates an advanced understanding of the target word 'classify' as shown by the student in group 1 during week 5 of the pushed email condition. This reveals that the student did not only learn the meaning and utilisation of the word 'classify,' but also its word formation processes, including suffixation and derivation (see Appendix 13). James (2013) defined word formation processes as the means by which new words are created or derived from existing words in a language. Word formation processes can influence the form, meaning, and grammatical class of words, and they can help learners increase the size and scope of their vocabulary (Ellis, 1997).

This study's findings on the function of word formation processes in L2 vocabulary learning are consistent with previous research. Word formation processes are regarded as a crucial aspect of lexical competence and development among L2 learners, as they reveal their knowledge of the internal structure and relationships of words (Laufer & Waldman, 2011). Inferring the meaning and utilisation of unfamiliar words based on their morphological components or patterns can also facilitate vocabulary learning (Schmitt & Zimmerman, 2002).

The student in group 2 in week 5 for the pushed email condition used 'defy' instead of 'differ' or 'conflict' in relation to suggestions, which is an example of a lexical item error. This error involves the use of a word that does not correspond to the intended meaning or the context of the sentence. While 'defy' means to resist, oppose, or challenge something or someone, 'differ' and 'conflict' mean to be unlike, dispute with or collide with something or someone. Therefore, the correct sentence should be:

- The artist and my sister's suggestions would often differ and she would get frustrated.
- The artist and my sister's suggestions would often conflict and she would get frustrated.

This error could have resulted from several potential causes, including:

- L1 transfer: The student may have used a word with a similar form or meaning to a word in their L1, but which is inappropriate in the TL context.
- Excessive generalisation: The student may have applied a rule or pattern that is applicable in some cases but not others. For instance, 'defy' may be an oversimplification of the prefix 'de-' used to create verbs indicating negation or opposition.
- Simplifying: The student may have opted for a simplified or more general word rather than one that was more complex or specific. For instance, 'defy' may be a shortened form of the verb indicating disagreement or incompatibility.

Intriguingly, the student used the word 'defy' appropriately in another sentence (see Appendix 16), indicating that she was familiar with its meaning and application. However, it is possible that she neglected to implement this knowledge consistently or accurately in various contexts. This inconsistency may reflect the variability and instability of L2 learners' lexical knowledge and performance (Laufer & Waldman, 2011).

However, it is necessary to acknowledge the limitations of this analysis of student writings. First, the sample size was exceedingly small, consisting of only three writing samples from a

single student over three periods (week 1, week 3, and week 5). Consequently, the results have limited generalisability and may not reflect the diversity of language learners in different contexts. The second criterion for evaluation was based on writing samples collected at specific points in the experiment. This may not encompass the full scope of vocabulary learning, nor does it account for other factors, such as motivation, attitude, or prior knowledge, that may influence vocabulary development. Thirdly, the selection procedure was based on a random sample from each cohort. This may not guarantee that the sample is representative of all proficiency levels or other factors that influence vocabulary learning. Consequently, additional research is required to confirm and expand the findings of this investigation.

Based on these limitations and implications, this analysis of student writings suggests some directions for future research on email-based interventions for vocabulary learning in terms of pushed output. One direction is to examine the effects of different types of feedback or corrections, such as explicit or implicit feedback (Ellis et al., 2006) or focused or diffuse feedback (Sheen et al., 2009), on vocabulary learning.

6.6 Experiences and Attitudes towards Learning English Vocabulary via Email

In this section, the results of the open-ended questionnaires are recapped and triangulated to respond to the second main research question and the fourth hypothesis. This question focuses on quantitative and qualitative data used to evaluate whether the participants' views aligned with the outcomes of the test scores.

To recap, the second main research question is:

What are students' experiences of and attitudes towards studying vocabulary using email as part of a technology enhanced learning approach to learning vocabulary?

(Hypothesis 6: Students' experiences with and attitudes towards studying vocabulary via email as part of a technology-enhanced learning strategy to use vocabulary are positive).

The goal of this second main question is to gather information from the participants via the questionnaire, which was prepared to explore students' experiences of and attitudes towards studying vocabulary using email as part of a technology-enhanced learning approach to learning vocabulary.

This section contains two parts. Part 1 discusses the results of the Likert scales, covering the students' experiences of and attitudes towards learning vocabulary, and, in turn, combining

learning vocabulary with using email. Part 2, by exploring the open-ended questions on the questionnaire, discusses how the participants felt about using email, the advantages and disadvantages of using email to learn vocabulary, and the reasons why using email helped them to learn words.

6.6.1 Discussion of using email from a quantitative perspective

The students had positive attitudes towards and experiences across the three sections of the questionnaire: learning vocabulary, using email, and learning vocabulary via the email. These findings confirm what other studies have found, such as Derakhshan and Hasanabbasi (2015), who showed that students have a positive opinion of using email to learn English via communication with others, and Andrew (2018), whose findings the current study supports by claiming that students have a positive attitude towards the use of technology in learning.

However, many questions remain unanswered here. For example, how did the participants feel about using email? What are the advantages and disadvantages of using email to learn vocabulary? And what are the reasons that using email helped the students to learn words? To address these questions, the next section gives a fuller picture of the students' experiences of and attitudes towards using email to learn vocabulary by quantitatively analysing the open-ended questionnaire questions.

6.6.2 Advantages and disadvantages of using of email from a qualitative perspective

Using technology to learn English has several benefits, as confirmed by numerous studies (Yao, 2011; Lauricella and Kay, 2013). One of the benefits of using email in writing concerns motivation. According to numerous studies (e.g. Yao, 2011; Lauricella and Kay, 2013), using email for learning English improves students' motivation outside the classroom. This finding concurs with the results of the present research, which found that the participants stated that engaging in email activities increased their motivation to learn and use in written form vocabulary. The participants also observed that they were excited about completing activities via email. One of the participants utilised email to write vocabulary in paragraphs to the teacher and preferred to receive feedback via email because she did not understand feedback in handwritten form.

Nevertheless, learners initially need to learn how to utilise the technology (email) before maximising its advantages. After having learned the technology, it can assist learners to write more freely, without pressure, and it might also decrease their anxiety about writing English because of its accessibility and flexibility, accompanied by a degree of feedback. Consequently, using email for learning English could improve students' motivation to progress with their English

vocabulary and writing using new words (in story format) more frequently and with more enthusiasm.

This result concurs with the findings of existing research (Yao, 2011; Lauricella and Kay, 2013; Nomass, 2013) which has shown that one of the principal benefits of the utilisation of technology is learner motivation. In this opinion, it appears that technology improves students' general motivation to learn. Nomass (2013) confirmed that and stated that adopting the use of email and text responses as a learning resource outside of the classroom could enhance motivation as there is evidence that email messages or text/type, rather than undertaking typical classroom activities, is considered less psycho-logically taxing by students.

One of the benefits of utilising pedagogical technology in English lessons from the qualitative results in the current research was that it focuses on self-learning. Theoretically, the sociocultural approach believes that learning and education are social activities. Learning starts at a sociable stage before students begin to formally try to understand and grasp it (Vygotsky, 1978). Concerning the sociocultural belief of thought, English feedback instructors and their learners experience the teaching and learning method actively by instructional technology like email, which is utilised in a virtual classroom. In other words, the technological means momentarily available could help student-centred education approaches. This is reflected in the fact that 18 of the students who participated in the open-ended questionnaires in the current study indicated that using email to complete activities was an excellent way to encourage self-learning. In this case, the participants studied independently outside the classroom, using six vocabulary items to write a story which they then sent to their teacher. The adoption of technology in the classroom is indeed becoming well recognised as a viable tool for students and teachers (Pirasteh, 2014; Shadiev et al., 2017). Part of the reason for the value of technology is that it encourages self-focused learning, which has been identified as beneficial in the enhancement and retention of knowledge in second language learning.

Although three of the participants expressed that, after the first week of the intervention, they still had some problems writing in Word documents and sending them via email, they began to learn how writing in a Word document and sending emails individually was beneficial. Furthermore, 27 participants agreed with the view that sending an email to their teacher one day without having to ask for help was helping them to build their knowledge and to edit their writing, with only limited teacher feedback.

Moreover, 28 of the participants reported that using email rather than a pen and paper increased

their self-confidence, and they stated that they felt a sense of freedom when using the former. For example, five participants stated that they liked being able to use email at any time without feeling pressure to 'do homework', adding that they could spend more time on their writing. They thought that using email decreased writing anxiety because there was no time limit for completing their writing tasks, compared to the classical technique of writing using pen and paper (which occurs in class). This finding concurs with other studies (such as Alemi et al, 2015; Maftoon et al, 2015; Han and Keskin, 2016) which have illustrated that the use of a digital medium produces greater benefits in terms of word learning and reduces levels of anxiety due to the less pressured learning environment.

Overall, the results reveal that the students who did pushed output activities made more progress than students who did non-pushed output activities in both the short and long terms in both the productive and VKS tests. Moreover, the students who did pushed email activities outperformed those who did activities via pushed output class activities in both the short and long terms. Furthermore, the effect size analysis of the productive test confirmed that completing exercises via email using the pushed output hypothesis was beneficial for learning vocabulary in the short and long terms. Also, the effect size analysis of the VKS test confirmed that completing exercises via email using the pushed output hypothesis was beneficial for learning vocabulary in the short and long terms. Finally, the quantitative results in Section A confirm the students' positive attitudes towards using email for learning vocabulary, analysed quantitatively.

Section B of the questionnaire comprised open-ended questions because many questions in section A remained answered; for instance, what the participants thought about learning English vocabulary via email, what the advantages and drawbacks were of utilising email in learning vocabulary, and why and how utilising email assisted the learners to learn words. Therefore, open-ended questions were used in Section B. Most participants understood the advantages and confirmed the significance of using email to learn English vocabulary by writing stories. Furthermore, they confirmed that using email for learning vocabulary was vital because they had previously experienced difficulties developing their vocabulary and explained that the technology played a supportive role in their education and insisted that they were not satisfied with the traditional methods used to teach English.

According to the experiences and attitudes of a majority of the participants in this study, then, email is a helpful means of boosting vocabulary learning in writing and, moreover, giving self-confidence.

Another advantage of using email in learning is that work can be saved to serve as an online knowledgeable store. From the results of the open-ended questions, 18 participants felt that a positive aspect of using email was saving answers online. One participant explained that she wrote a story each week using the six words provided and saved the activity in her email. After receiving feedback from the teacher, which she also stored in her email, she was able to use the feedback and look at her answers any time and any place, rather than have to search through printed papers, which could get lost. Another participant said that it was useful to keep all answers and feedback in one place so they can be revised before tests, adding that it gave her the opportunity to look at the teacher's feedback. This result shadows the findings of Howard and Scott (2017), who also found that students felt satisfied storing online documents that could allow them to read and check their writing any place and time.

In terms of studying any time and any place, this assists the development of classroom-based education by extending the education environment to the online world. Using email outside the classroom allows learners to extend learning outside the formal learning environment through the internet, which is available 24 hours a day for learners to use when and as they feel (Harris, 2009).

The current research investigates how the use of email in learning vocabulary might be helpful online as it allows EFL learning to occur beyond the borders of the class. For example, the utilisation of email as online learning authorises learners to deal with challenging educational situations to allow them to learn new knowledge and evaluate reflectively (Sun & Chang, 2012). This is in agreement with Howard and Scott (2017), who contended that one of the advantages of utilising email for learning vocabulary is that online learning enables learners to follow their studies at any time and in any place.

Another advantage of using email for learning English vocabulary is supporting participants in adapting to the process of using email. Thirty-eight participants felt positively about the impact of using email to write a story using words. They were able to plan, draft, revise and proofread before presenting their story. These participants stated that using email improved their ability to utilise the target items appropriately and claimed that they did not study sufficiently in class all the stages of writing the six items in story format. As one participant stated, "While I had to write in class, I began to write directly without planning, drafting and even revising", which she attributed to a "lack of time". Based on these views, it can be seen that the participants perceived certain advantages of using email to write a story as email allowed them to more carefully consider the different stages of writing.

The finding that email supported the participants to adapt to the process. The implications of these findings for English majors in Saudi universities are substantial. The use of writing is similar to the findings of other researchers (Bouhnik and Deshen, 2014; Allagui 2014) who have shown in their research that one of the principal benefits of the utilisation of technology is that it supports participants to adapt to the process of writing. In this opinion, it appears that the utilisation of technology does improve students' writing skills.

Lastly, although technology has a number of clear benefits, it also has some drawbacks. The open-ended survey outcomes reveal that four participants experienced problems connecting to the internet during the first two weeks of the intervention due to poor connectivity in the area in which they lived. They noted that one of the problems of using email was the requirement for a good internet connection. One participant who did not have an internet connection at home needed to go elsewhere to complete her activity and email it to her teacher. Another participant mentioned another issue, namely broken hardware, which meant she was unable to revise her answer. The use of email obviously requires good internet connectivity, a factor which some participants pointed out as not always the case. Two more participants felt that using email could adversely impact their handwriting. They acknowledged that using technology (email) was essential and beneficial for learning English, but that losing the skill of handwriting could be detrimental in some ways. This finding concurs with other studies (e.g. Campbell, 2003; Wu, 2006; Fageeh, 2011; Aljumah, 2012; Alsamadani, 2018) which have noticed that the utilisation of technology had certain drawbacks, including internet connection, lost time with broken devices, fear of losing the skill of handwriting, and other technological difficulties.

6.7 Summary of Discussion Chapter

This chapter has presented and discussed the results of the three conditions (pushed output in the class, pushed email and non-pushed class) across the three groups in order to explain the differences, as well as considered the participants' attitudes towards and experiences of using email, thereby combining the study's conceptual framework and literature review.

The chapter has considered the main findings and their importance. It then answered the research questions by testing the hypotheses, as well as linking the results with the literature reviewed in Chapter 2 and Chapter 3. It was revealed that the learners who did exercises via pushed output were more effective at learning vocabulary than learners who did exercises without pushed output, in both the short and the long terms. The results of the questionnaire are linked with previous studies which have shown that pushed-output seems to lead to improved conditions for vocabulary learning. A number of studies have focused on pushed output in

learning vocabulary, as noted, but the original contribution of the current study is that it offers a mixed methods research and focuses on intermediate level English major undergraduates over the long and short terms, filling a number of gaps in the existing literature.

The chapter then began to answer the question whether the use of pushed email might lead to improvements in students' vocabulary skills in the short and long terms than participating in a pushed output class. Indeed, in this study, learners who completed exercises via pushed email were more effective at learning vocabulary than learners who did exercises in a pushed class not utilising email, in both the short and long terms. This finding concurs with existing studies (Uzunboylu et al, 2015; Aw et al, 2015 Stockwell & Liu, 2015; Wong & Looi, 2010; Zhang, et al., 2011; Saran, et al., 2012) which have determined that technology is helpful for learning vocabulary as it exposes students to the spaced repetition of lexical items, which is seen as more efficient than a high level of repetition.

The chapter then answered the question whether the use of email and pushed output provide additional improvements to students' vocabulary skills over the short and long terms. The effects of using email when supporting and enhancing the process of pushed output were evaluated in terms of gain scores for pre- and post-tests in the short term and pre- and delayed post-tests in the long term. Although it is admittedly not easy to measure this impact, the effect size was used to analyse the first main research question and the first sub-question (i.e. to determine if pushed output and email have a greater impact than expected). It was found that the largest effect size for the gain scores across the short term and the long term was for pushed email versus the pushed class; students who did exercises via email with pushed output gained more vocabulary than students who did exercises solely via a pushed class. In other words, students who completed exercises via email outside the class utilising pushed output had a higher effect size than students who engaged in pushed output in the classroom.

The finding that students improved their vocabulary via technology (email) with pushed output in the short term in a productive test and a VKS test (measured by effect size) concurs with Alsaleem's (2013) study in terms of its short-term results. The current study adds to Alsaleem (2013) by investigating the long term, finding a significant difference between students doing pushed output exercises via email and students doing pushed output exercises without technology. The wide body of research into English learners has not focused on pushed output and technology combined with vocabulary, except a study by de la Fuente (2003), which focused on Spanish learners acquiring the meaning of nouns (in contrast to the current study's focus on English learners learning English vocabulary) (although each area of study has been explored

independently - see Razak et al, 2013; Alsaleem, 2013; Allagui, 2014). The current study confirms and supports these studies.

The chapter also aimed to test Hypotheses 4 and 5 and address research questions pertaining to the influence of three distinct conditions on vocabulary learning in language learners: pushed output, non-pushed output, and pushed email. The study examined 27 writing samples from each participant, gathering three samples during weeks 1, 3, and 5, for a total of nine samples per subject. To analyse these writing samples, two methods were employed: a quantitative analysis of vocabulary size, following the guidelines proposed by Meara and Miralpeix (2016), and a qualitative analysis of lexical errors, employing Engber's (1995) taxonomy, which considered two dimensions: lexical choice and lexical form. The results found pushed email to be the optimal condition for vocabulary use in terms of vocabulary size, whereas both pushed class and pushed email are optimal conditions for enhancing lexical choices and forms accuracy over time.

The final research question concerns students' experiences of and attitudes towards studying vocabulary using email as part of a technology enhanced learning approach to learning vocabulary. The quantitative results in Section A confirm the students' positive attitudes towards using email for learning vocabulary, but these results indicate that many questions remained answered. Therefore, Section B of the questionnaire consisted of open-ended questions to explore in more depth the participants' opinions. The open-ended questions confirmed that using email is useful for learning vocabulary. The participants explained that using email played a positive role in studying English, adding that they were generally dissatisfied with the traditional teaching methods. They opined that traditional methods alone were insufficient, and added that perhaps combining them with more modern methods could increase their knowledge and improve their learning. Practicing language frequently by writing in a virtual environment outside the classroom provided these learners with a sense of freedom and exposure to various writing techniques, along with instructor feedback. The open-ended questions further showed that the majority of the participants understood the advantages and confirmed the significance of using email for learning English vocabulary in writing.

The chapter ended by discussing the implications of the study, which generally suggest that educational policy and teaching methods need to be re-evaluated in Saudi Arabia in terms of class sizes, preparation of students before they enter university, and utilisation of technology for learning.

Chapter 7. Conclusion

7.0 Introduction to the Chapter

This concluding chapter contains six sections. The chapter starts with a re-evaluation of the study's objectives and the research questions, in Section 7.1. The second section reviews the central outcomes and the discussion. Then, Section 7.3 addresses the current study's research contributions, which have theoretical and practical directions. Section 7.4 considers the study's limitations. Section 7.5 discusses suggestions for additional and further research. Next, Section 7.6 looks at my individual reflections on the research journey. Lastly, Section 7.7 summarises the chapter.

7.1 Re-evaluating the Study Objectives and Research Questions

This study has contrasted the effectiveness of two kinds of pushed output vocabulary learning activities and one type of non-pushed output for the English vocabulary learning of Saudi Arabian undergraduate EFL students. One activity is technology-based (an email group), one is non-technology-based (a classroom) and includes pushed output, and the third is non-technology-based and involves non-pushed output (a classroom activity using a traditional teaching approach). These activities were designed to develop and/or improve learners' academic achievements. A total of 54 adult Saudi EFL students, recruited from three third-year English specialisation classes at Qilwah College of Arts and Sciences at Albaha University, took part in the study.

The study design consisted of three groups and three target vocabulary sets/lists to compare learners being taught via the three mentioned conditions. Moreover, the study deployed quantitative and qualitative research methods and incorporated a pre-test, a post-test, a delayed test and a questionnaire. The use of immediate and delayed post-tests may highlight the influence of the testing effect (Roediger & Karpicke, 2006), which suggests that the long-term retention of knowledge is increased when there is testing during the learning process and effective feedback is provided.

The study identified the extent to which the use of a modern technology (i.e. email) in pushed output classes might improve learners' academic achievements, specifically in English language teaching at a Saudi Arabian university, where, currently, almost all university courses remain wedded to a traditional face-to-face approach and methods. The study will fill a gap in studies of Saudi Arabia concerning the use of technology in relation to the pushed output hypothesis. Although the study focuses on Saudi Arabia, the results may be generalisable.

The study also provided a clear view of the attitudes and experiences of undergraduates with regard to utilising technology to develop vocabulary at Saudi Arabian universities in terms of pushed output or learning in classrooms without pushed output. In addition, the results of the research could assist and enable educational decision makers add learning via technology to modules taught at universities if the outcomes of the study do indeed confirm that technology plays a major beneficial role in the learning of vocabulary. Moreover, this study acknowledged the substantial role vocabulary plays in learning a second language. Learning vocabulary is necessary for communicative competence and to understand a language (Schmitt, 2008). Few studies have contrasted the effects of digital-based activities and classroom-based activities on developing vocabulary regarding pushed output for English intermediate undergraduates; therefore, given the increased prevalence of technology-based learning, this area warrants additional research.

This thesis posited two main research questions. The first one was: “Is there a difference in the vocabulary used in short and long terms through participation in non-pushed output classes, or in learning environments with pushed output?” This question evaluates the significance of pushed output in terms of English vocabulary usage. It takes into account gain scores for pre- and post-tests in the short term and pre- and delayed post-tests in the long term, with a focus on writing skill and the use of target vocabulary at various timepoints. Two sub-research questions followed from this question: 1) Is there a difference between the use of pushed output using email for students’ vocabulary skills and participation in a pushed output class without email in the short and long term? This question evaluates the role of pushed email and its contribution to language used in terms of gain scores for pre- and post-tests in the short term and pre- and delayed post-tests in the long term in terms of writing skills and the use of target vocabulary at various timepoints. The first question and sub-research question were answered via a quantitative approach which evaluated test outcomes. And: 2) Does the use of the combined effects of email and pushed output provide additional improvements to students’ vocabulary skills over the short and long terms? This question evaluates the effect of email on supporting and enhancing the process of pushed output. It also allows a novel contribution to language learning in terms of gain scores for pre- and post-tests in the short term and pre- and delayed post-tests in the long term. The effect size was used to analyse the second sub-question of the first main research question (to determine whether pushed output and email have greater effects than what was hypothesised).

The second main research question was: “What are students’ experiences of and attitudes towards studying vocabulary using email as part of a technology enhanced learning approach to

use vocabulary?” This second main research question was answered using quantitative and qualitative data to explore students’ views in terms of whether their views aligned with the outcomes of the test scores.

In terms of hypotheses, a review of the existing relevant literature review and theories in the field led to the following hypotheses being devised:

(Hypothesis 1: There is a statistically significant difference between the gain scores of pre- and post-testing of students who participated in a pushed class and students who participated in a non-pushed class).

(Hypothesis 2: There is a statistically significant difference between the gain scores of pre- and post-testing of students who participated in a pushed class using email and students who participated in a pushed class without email).

(Hypothesis 3: There is an effect size between the gain scores of students in pre- and post-testing using a combination of email and pushed output compared to students studying only in a pushed output class).

(Hypothesis 4: There is a considerable difference between the vocabulary size of students who have participated in a pushed email condition and those who have participated in a pushed class or non-pushed class condition).

(Hypothesis 5: Over time, there is a significant improvement in the lexical choices and forms of students exposed to pushed email, pushed class, or non-pushed class conditions).

(Hypothesis 6: Students' experiences with and attitudes towards studying vocabulary via email as part of a technology-enhanced learning strategy to use vocabulary are positive).

In terms of delayed post-tests for the first three hypotheses above, there was a significant difference between the gain scores of pre-testing and delayed post-testing, considering that the long-term retention of language knowledge by students needs to be assessed by regular formative testing (Shafaei & Abdul Rahim, 2015; Amin & Mojavezi, 2017), and the delayed post-tests demonstrated a favourable outcome for students’ vocabulary retention (Altalhab, 2018).

7.2 Review and Discussion of Central Outcomes

The aim of the present study was to compare three conditions (pushed email, pushed class and non-pushed class) in terms of their effects on three study groups. A mixed methods approach was used to collect the data. Productive and VKS tests were used to answer the first main question and sub-question and testing students' experiences and attitudes towards using email for learning English vocabulary was used to answer the second main research question.

For the short term, the gain scores from pre-testing to post-testing were used, and for the long term, the gain scores from pre-testing to delayed post-testing were used. Pushed class conditions allowed for higher results in both the productive and VKS tests in both the short and long terms than the non-pushed class. In other words, learners who did exercises via pushed output outperformed learners who did exercises without pushed output in the short and long terms in terms of learning vocabulary.

As for the main research question, it examined whether participation in non-pushed output classes or pushed output classes results in a difference in vocabulary usage over the short and long terms. The evaluation centres on the effect of pushed output on English vocabulary by analysing short-term (pre- to post-test) and long-term (pre-test to delayed post-test) gain scores and the use of target vocabulary in writing at time points. The results demonstrate that pushed class conditions lead to superior results on both productive and VKS tests in both the short and long term, as compared to non-pushed classes, indicating that students who engage in vocabulary-learning exercises in pushed classes are more effective. Moreover, in terms of vocabulary size, the findings indicate that a pushed class is better than a non-pushed class for vocabulary use. In contrast to the non-pushed class condition, both pushed class and pushed email are optimal conditions for enhancing lexical choices and forms accuracy over time.

The first sub-question of the first main question of the study investigated whether using pushed output via email for students' vocabulary skills differs from participation in a pushed output class without email, both in the short and long terms. The function of pushed email in language learning was evaluated by measuring score gains at pre, post, and delayed post time periods, as well as the use of target vocabulary in writing. Compared to the pushed class without email, pushed email conditions produced better outcomes on both the productive and VKS assessments, both in the short and long terms. This suggests that, over time, students who engage in vocabulary exercises via pushed email are more effective than those in a pushed class without email. In terms of vocabulary size, the results indicate that pushed email provided the optimal

condition for vocabulary use, outperforming both pushed class and non-pushed class conditions. In addition, the study found no significant difference between pushed email and pushed class in terms of improving lexical choices and form accuracy over time. Nevertheless, both pushed email and pushed class were determined to be better than the non-pushed class condition. This suggests that while there may be no difference between the two in terms of improving lexical choices and form accuracy, both methods are still more effective than not using any pushed educational approach at all.

For the second sub-question of the first main question, although it is difficult to measure, the effect size was used to analyse the two comparisons, the first main question and the first sub-question of the first main question (to determine if pushed output and email had greater results than expected) in order to answer this question. In both tests, the largest effect size for the gain scores across the short term and the long term was for the pushed email versus the pushed (non-email) class. This means that students who completed their exercises via email outside the class using pushed output had a greater effect size than those who engaged in pushed output in the classroom.

Analysis of student writing excerpts from the pushed email, pushed class, and non-pushed class conditions casts light on the efficacy of language instruction. The quantitative analysis of vocabulary size revealed that all 27 writing excerpts in the pushed email condition had significantly larger vocabulary sizes. Each student produced nine samples of writing during weeks 1, 3, and 5. The pushed email condition accelerated and sustained vocabulary growth. In addition, a qualitative analysis was conducted to identify and classify lexical errors made by L2 learners in their written work. On the basis of lexical choice and lexical form, Engber's (1995) taxonomy of lexical errors was applied to the analysis. Examples of particular error categories, such as improper word usage, misspellings, and verb form errors, were provided. The analysis revealed frequent errors across a variety of instructional conditions and periods. Notable advances were observed in the lexical selections and forms of some students over time. This analysis offers valuable insight into the nature of lexical errors made by students and their language learning progress.

For the second main research question, answers to the questionnaire explored the students' experiences of and attitudes towards using email in learning English vocabulary. The quantitative results in Section A confirmed the students' positive attitudes towards using email for learning vocabulary. Section B was essential to extend Section A's results to determine and evaluate

precisely how the participants felt about using the email intervention. The participants confirmed that using email to learn vocabulary was vital because they had previously experienced problems developing their vocabulary. In addition, the participants reported the advantages of using email for learning vocabulary, such as supporting them in adapting to using email, improving learner motivation, self-taught learning, and saving answers online. Using email for learning English vocabulary supported the participants to adapt to the process of writing, with the participants feeling confident about the influence of utilising this technology to write a story utilising given words, including planning, drafting, revising and proofreading before presenting the story. In sum, their ability to use the target items improved through the intervention. Due to time limitations, the participants did not study all the stages of writing the six items in a class in story format. In terms of motivation, the findings revealed that engaging email exercises improved motivation to learn and utilise vocabulary in written form. In terms of self-taught learning, technology encourages self-focused learning, which has been identified as helpful for enhancing and retaining knowledge in L2 learning. The participants felt that saving answers online was a positive of using email. One participant wrote a story each week using the six words provided and saved the activity in her email. After receiving feedback, which she also stored in her email, she could utilise that feedback and review her answers anytime and anywhere, rather than have to search through printed papers, which are easily lost.

On the other hand, some participants faced difficulties such as technical problems and a lack of opportunity to practice their handwriting. Four participants encountered difficulties connecting to the internet during the first two weeks of the intervention; therefore, a good internet connection is essential. Another identified problem was faulty hardware. Finally, it was noted that utilising email could have detrimental implications for hand-writing.

The implications of these findings for English majors in Saudi universities are substantial. Prior research has primarily concentrated on non-English majors and secondary school students, while English majors have received scant attention. By examining the relationship between technology and ESL pedagogy in the Saudi Arabia, this study fills a Saudi Arabia-specific contextual gap.

This study employs a mixed-methods approach to compare the short- and long-term effects of technology on the learning of English vocabulary among intermediate undergraduate English majors at a Saudi university in order to fill this knowledge gap. In doing so, it sheds light on the specific requirements and obstacles encountered by English majors in Saudi Arabia when incorporating technology into their language learning process.

In addition, this study aims to address a ‘digital divide’ gap that has become more evident since the outbreak of the Covid-19 pandemic. The world as a whole has been affected by this divide, not just Saudi Arabia. The pandemic has had a significant impact on education, leading to the widespread adoption of email and Zoom-based online teaching techniques. Therefore, it is imperative to perceive the impact of technology on English as an Additional Language (EAL) pedagogy in the KSA and internationally.

This study's findings provide multiple benefits for English graduates from Saudi universities. First, they cast light on the efficacy of various technology-mediated approaches to vocabulary learning, allowing English majors to make informed choices when selecting tools and strategies to enhance their language skills.

In addition, understanding the impact of technology on ESL pedagogy in the context of the KSA can inform curriculum design and instructional practises in English major programmes. The research findings can be utilised by educators to create more effective and engaging language learning environments for their students.

This study contributes to the field of ELT and learning by addressing knowledge gaps concerning the incorporation of technology in ESL pedagogy. It sheds light on the unique obstacles encountered by English majors and offers valuable insights that can inform future research and the development of evidence-based teaching strategies.

7.3 Research Contributions

Overall, the current study's results support existing knowledge about the affordances of educational technology for learning English vocabulary in terms of verbs and abstract nouns to improve writing (e.g. Song & Fox, 2008; Cavus & Ibrahim, 2009; Al-Ahdal & Alharbi, 2021). Moreover, the results provide direct contributions to knowledge in both theoretical and practical directions.

The purpose of this study was to examine the effectiveness of two types of pushed output vocabulary learning activities and one type of non-pushed output on the short- and long-term learning of English vocabulary by Saudi Arabian undergraduate EFL learners, as well as to investigate their experiences and attitudes regarding the use of technology (email) for learning English vocabulary. Other goals included comparing the vocabulary size of students in different conditions (pushed email, pushed class, and non-pushed class) and measuring the changes in lexical choices and forms over time for students in different conditions.

In terms of improving the vocabulary of EFL undergraduates in their writing, the results could be drawn on to stress how the implementation of technology with pushed output in EFL classrooms can aid learning at Saudi Arabian universities. Extensive experience with and attitudes to utilising educational technology's affordances were determined in line with developing educational knowledge. To identify a novel contribution, many previous studies carried non-English majors and some in high schools, although few studies have focused on students taking an English major.

Moving to the theoretical and practical contributions, the study supports the theory of pushed output for learning vocabulary via email. This finding is clear from the results of the productive test and the VKS test as well as the open-ended questions. Learning vocabulary with pushed output via email allows students to learn in their own time, aided by teacher feedback. It is acknowledged that technology requires effective internet access and modern devices. However, using email is more productive for improving vocabulary and writing knowledge than traditional methods are.

The research suggests that pushed output and technology could assist students to learn vocabulary when writing in a place and time of their own choosing and producing language not by using pre-taught words and writing them in story format, emailing it to the teacher, and then receiving feedback. This entire process of pushed output allows the students to utilise technology to more effectively learn confidence using vocabulary.

The research suggests that pushed email activities allow-governed learning to improve motivation, cognitive skills development, and language skills, as well as decrease the anxiety which is often encountered during writing. The students who used the pushed output, either via email or in class, wrote more extended sentences, created more ideas, and had larger vocabulary storage vis-a-vis non-pushed output using traditional methods.

The practical contributions of this study concern recommendations for how pushed email could be efficiently incorporated into the writing and vocabulary classroom. It could be of value to introduce pedagogical technology to learners at Saudi Arabian universities by integrating learning vocabulary with email via a pushed output approach.

Although numerous studies have examined how messaging application technologies enhance the effects of digital-based activities inside or outside the classroom, as well as the impact of the learning environment for the learning of vocabulary, the current work fills a specific gap in the literature by combining pushed output vocabulary learning with a messaging application

technology and focusing on adult English major undergraduates learning writing at a university in Saudi Arabia. In the wide body of research on language learners, only one study has looked at pushed output and messaging application technology and vocabulary learning with undergraduate students at university level. However, this study, by de la Fuente (2003), focused on Spanish learners, in contrast to the current study's focus on English learners.

This dissertation also addresses other gaps in the literature and explores hitherto under-studied problems. For example, there is a lack of studies on the learning of vocabulary where the focus has been on learning and testing vocabulary knowledge through pushed output with English language university students over the short and long terms. In higher education today, university students are ideal subjects for the researcher. This is because they are adults and capable of making decisions for themselves, accepting research requirements and accepting them. Research involving children, for example, would have had huge ethical complications, including requiring parental consent, and the consent of the school – as gatekeepers of the children. Further to this, university students can be greater informed about the study and participate to a higher level than children.

Moreover, to the researcher's mind, no study has been conducted on technology enhanced vocabulary learning activities that focus on the pushed output approach to learning with English language undergraduate students at a university in Saudi Arabia. In this paper, the social learning theory of Vygotsky, incorporated with the findings on pushed learning theory and the changes in global circumstances due to the pandemic, with ensuing (enforced) pedagogic changes, all make this paper ever more relevant. The dissertation is also innovative in using the pushed output hypothesis to design course materials and test vocabulary through a VKS test and a productive knowledge test, unlike existing Saudi-based studies, which have used the teaching in interaction hypothesis when using technology. Finally, in Saudi Arabia, learning English is still taught in a traditional, instructor-centred way. It is hence useful to ponder whether there are barriers for L2 learners using messaging technology in learning English vocabulary in the Saudi Arabian university setting. In these ways, it is hoped that the present study will provide some original contributions to the relevant literature.

7.4 Limitations of the Current Research

All research has limitations. The main limitation of the current research concerns the sampling. The selected sampling method included three groups. I needed four groups, but at Albaha University there are only two or three classes at each level. Where the four groups and four conditions would have been more appropriate for the study, I added the condition that contains a non-

pushed class and email technology, and because no condition contains a non-pushed class and non-email technology outside the class, I used the calculating effect size to identify a statistical benefit for both comparisons (pushed class versus non-pushed class, and pushed email versus pushed class) to determine whether pushed output and technology are beneficial for learning English vocabulary. Unfortunately, there was no correlation between positive attitudes to technology and the effect size. This means that, in theory, a pushed output home-based programme may be rolled out irrespective of the students' attitudes to technology.

The participants were not randomly selected because it was difficult to ask Albaha University to get randomly selected students in one level and divide them into groups every week for five weeks and then get the same participants five weeks later to do a delayed post-test. However, the students in the three groups, who were from intact classes at Albaha University, decreased the time and resources expended on randomisation and pre-screening, which allowed for creating a more natural setting to track the development of students' achievements (Mackey & Gass, 2016).

Because Saudi Arabia is a traditionally conservative culture, another limitation was not using interviews given that most Saudi women prefer not to have their voice recorded or to have videos made. This factor prevented the utilisation of semi-structured interviews, and therefore open-ended questions in questionnaire format were used instead. However, the advantage of the interview process is that it gives a better answer rate than open-ended questions in a questionnaire. Several people who neglected the questionnaire would likely have been prepared to talk in an interview.

7.5 Suggestions for Additional Research

This study focused on technology-enhanced vocabulary learning activities via writing skills using a pushed output approach to learning with English language undergraduate EFL students at a university in Saudi Arabia. It would also be useful to focus on speaking skills with Saudi Arabian high school students as, to the researcher's mind, no study to date has been conducted on technology-enhanced vocabulary learning activities for speaking skills over the long term using the pushed output approach.

Although the 54 participants in this study can be accepted as a good sample size comparable with other key studies, such as de la Fuente's (2003) 20 sample size, Razak et al.'s (2013) 24 sample size, Alsaleem's (2013) 30 sample size, and Allagui's (2014) 50 sample size, it would have been more effective to collect data from an even larger sample. Moreover, it is essential

to identify that this research studied students' experiences with and attitudes towards using technology in learning English vocabulary. Therefore, it would have been useful to conduct a study on students' and teachers' experiences of using messaging applications in learning English vocabulary at Saudi Arabian universities and then explore any differences between them.

This study was conducted at one Saudi Arabian university. It would be useful to expand the research by investigating other universities in the country to assess the representativeness of the research's conclusions. Likewise, it would be helpful for future studies to carry out comparative research with other nations across the Middle East (and, indeed, beyond). Policy changes to pedagogy consist of essential political decisions that other nations have examined. Consequently, it could assist Saudi Arabia to be better advised regarding what works in an appropriate sociable context and how it is preferable to achieve what is found to be effective.

Finally, it could be recommended that further study on utilising technology in learning English vocabulary might use various data collection methods, for instance, by observing two classes, utilising the technology in a WhatsApp group, and utilising classical methods in the class with paper and pen and comparing the learners' progress. The participants of such studies could be undergraduates.

7.6 Individual Reflections on the Research Journey

I started my PhD journey in September 2017, since when I have attended several workshops at Newcastle University's Faculty of Humanities and Social Science (HASS). The 162 hours of courses were very useful for me. I also registered to obtain a Postgraduate Certificate in Research Training, which is very important to improve my research training and will surely prove to be an invaluable addition to my CV. I also registered for, and benefitted from, the following research modules: Managing a PhD, Information and Library Skills and The Nature of Explanation and Inquiry (in the first semester) and Introduction to Quantitative and Qualitative Methods and Critical Analysis (in the second semester).

As a PhD student conducting research, I am heartened that I have successfully gathered appropriate references for my project. This success was primarily due to the methods acquired at Newcastle University, particularly at HASS. As noted above, HASS offers many workshops, some of which are related to information and library skills. I learned how to use Endnote software, which I have used frequently to identify appropriate sources. I have also gained knowledge in searching for and finding particular sources in my field of research and have acquired relevant skills for planning and developing literature searches, employing strategies in

order to manage references, keeping up with current research in the field, and improving my awareness of scholarly communication problems. Finally, I have gained familiarity with open access publishing, copyright issues, and other research skills at various HASS workshops.

In support of developing the theoretical framework of my PhD project, I have benefitted in particular from one of the modules at HASS, namely, The Nature of Explanation and Inquiry. This module focuses on research theories, two of which I went on to connect to my research. It is important to decide which research approach is appropriate, taking into consideration a study's nature and goals.

A useful workshop at HASS introduces the invaluable SPSS software, which I went on to master. I attended four sessions: Questionnaire Design, Cross Tabulations Inferential Statistics, and Analysis of Variance and Correlation. Later, I took a mock exam and then a real exam testing proficiency in SPSS (the Data Practical Exam). This five-page exam consisted of questions using SPSS for analysis. I received a good mark and without the HASS introductory course I am sure this would not have been possible.

In 2018 I attended the Lexical Studies Research Network Conference and presented a poster related to my current PhD project. The conference was hosted by Swansea University, and was held at the National Waterfront Museum in Swansea, UK.

I conducted a pilot study for my PhD project between 14 January, 2019, and 7 February, 2019, to assess its viability and to help me determine how to implement the proceedings of the main data and to examine any aspects that needed to be modified. It also allowed me to identify new and essential ideas with respect to data-gathering instruments. After arriving in Newcastle, I met with my supervisors and we discussed the pilot study. We collected important points and I explained these points in the section of the pilot study (see the Methodology Chapter).

I started the third year of my PhD in September 2019. I conducted the main study for my PhD project between September 2019 and December 2019. After arriving in Newcastle, I met with my supervisors, and we discussed the main study. As I was attending workshops at HASS, the COVID-19 pandemic broke out and forced the university to close. Before the closure, I usually coded my data at a university computer, and I subsequently struggled to do this from my personal laptop. Therefore, I borrowed a university laptop, which meant that I had to wait before I could re-commence coding, meaning the process was set back about one month to the timeline of my PhD.

I travelled to Saudi Arabia for a holiday in September 2020 and had to do quarantine in a hotel for 14 days. When I returned to the UK, I had to do another 14 days in quarantine. Therefore, as I was on holiday, I did not work on my research in Saudi Arabia for a full month and lost 28 days in quarantine. As a result, I was unable to complete the results chapter at the planned time according to my original old timeline (I had returned the university laptop to my university before leaving the UK for my vacation); therefore, I requested a 3-month extension from the school, which was approved.

At the end of my PhD thesis, I consider that undertaking this research has provided me with an excellent chance to explore critical issues linked to instruction and learning language and fulfilment in a particular educational context, as well as greatly improving my research skills. Furthermore, this PhD journey has provided me with a vast knowledge about what English undergraduates face during their studies and the potential offered by technology to support them in their struggle to learn English vocabulary (in combination with developing their writing skills). Furthermore, the PhD has likewise extensively improved my theoretical and practical knowledge in field of Applied Linguistics. Ultimately, although my PhD journey has undoubtedly – and predictably – been a challenge, it is this very challenge that has made it so valuable for my professional, educational, and personal development.

In terms of publishing papers, I published three papers, one was taken from my master thesis, one was from my project before I started my PhD, and the last paper cooperated with my colleague who is a PhD student at Newcastle University. We published this paper in Jan 2022, and it was about the transition to online EFL teaching in Saudi Arabian universities during the COVID-19 outbreak. Now I am working on the project with my colleagues' professor Anouchka Foltz who is an assistant professor in English Linguistics at the Institute of English Studies at the University of Graz, and Dr Alaa Alahmadi, who is an assistant professor of Applied Linguistics at King Abdelaziz University, and this project is funded by King Abdelaziz University. It is about learning English via technology.

7.7 Summary of Conclusion Chapter

This concluding chapter has represented and discussed the study objectives and research questions and reviewed the central outcomes of the study. Then, the chapter presented the research contributions in terms of both theoretical and practical knowledge. The study supported pushed output theory for learning vocabulary via technology, specifically email. The findings from the productive test and the VKS test revealed that students who learned vocabulary via email with pushed output learnt vocabulary better than students who learned vocabulary via pushed output

and students who learned via non-pushed output. In addition, the chapter presented the results of 27 writing samples collected from each participant during weeks 1, 3, and 5, for a total of nine samples per participant. In terms of vocabulary size, the results indicated that pushed email was the optimal condition for vocabulary usage. Moreover, both pushed class and pushed email were identified as optimal conditions for enhancing lexical choices and form accuracy over time. In terms of the questionnaire, the students preferred to use email to learn English vocabulary over the traditional method of pen and paper. Many advantages of that were noted. Moreover, the chapter looked at the limitations of the current research, namely the sample size and the participants not being randomly selected.

The chapter then discussed further suggestions for additional research into technology-enhanced vocabulary learning activities for speaking skills over the long-term using the pushed output approach, increasing the sample size, and conducting comparative research with other countries across the Middle East. Lastly, the chapter offered some individual reflections on my research journey, including attending workshops at the Faculty of Humanities and Social Science of Newcastle University and the obtaining of the Postgraduate Certificate in Research Training in the first year of my PhD journey. The chapter ended with some reflections on how the COVID-19 pandemic influenced me and the research project.

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Appendices

Appendix 1: Participant Information Sheet



Newcastle University
School of Education, Communication & Language Sciences

1. You are invited to take part in a research study entitled **“The Effects of Technology- and Non-Technology-Based Vocabulary Learning Activities on Saudi EFL Learners’ Pushed Output Vocabulary Production”**.
2. Please read this document carefully and ask any questions you may have before agreeing to take part in the study.
3. The study is conducted by Saad Eid Albaqami as part of his PhD study at Newcastle University
4. This research project is supervised by Dr Elaine Lopez and Dr Nick Riches from the School of Education, Communication & Language Sciences at Newcastle University.
5. The purpose of this study is to research the effects of three different types of vocabulary learning tasks on the vocabulary learning of adult Saudi EFL learners. This will help learners and teachers to grasp the effect of email in the process of learning and teaching.
6. You have been invited to take part in this study because your level is intermediate and you are one of the students at Albaha University.
7. If you agree to take part in this study, you will be asked to complete some short exercises in the three conditions every week for 5 weeks and pre test, post test and delayed post test and complete questionnaire.
8. Your participation in this study will take approximately three hours a week, which will be during your usual English lessons.
9. You are free to decide whether or not to participate. If you decide to participate, you are free to withdraw at any time without any negative consequences for you.
10. All responses you give or other data collected will be kept confidential. The records of this study will be kept secure and private on a password protected computer on the university server. All files containing any information you give will be password protected and/or locked. In any research report that may be published, no information will be included that will make it possible to identify you individually. There will be no way to connect your name to your responses at any time during or after the study.
11. If you have any questions, requests or concerns regarding this research, please contact me via email at s.e.s.albaqami2@newcastle.ac.uk or by telephone at 00447490202231 or 00966555739769

This study has been reviewed and approved by the School of Education, Communication & Language Sciences Ethics Committee at Newcastle University (date of approval: 28/11/2017)

Faithfully yours

Saad Albaqami (PhD researcher)

Appendix 2: Consent Form



Newcastle University

School of Education, Communication & Language Sciences

Declaration of Informed Consent

- I agree to participate in this study, the purpose of which is **to compare the effects of three different types of vocabulary learning activities on the vocabulary learning of adult Saudi EFL learners. To help learners and teachers to grasp the effect of email in the process of learning and teaching.**
- I have read the participant information sheet and understand the information provided.
- I have been informed that I may decline to answer any questions or withdraw from the study without penalty of any kind.
- I have been informed that all of my responses will be kept confidential and secure, and that I will not be identified in any report or other publication resulting from this research.
- I have been informed that the investigator will answer any questions regarding the study and its procedures. The investigator's email is s.e.s.albaqamiz@newcastle.ac.uk And they can be contacted via email or by telephone on 0044790202231 or 00966555739769
- I will be provided with a copy of this form for my records.

Any concerns about this study should be addressed to the School of Education, Communication & Language Sciences Ethics Committee, Newcastle University via email to ecls.researchteam@newcastle.ac.uk

Date	Participant Name (please print)	Participant Signature
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I certify that I have presented the above information to the participant and secured his or her consent.

Date	Signature of Investigator
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Appendix 3: The Treatment Fidelity

This checklist will be ticked after the data collection.

		Lessons and examination	Yes	No
Treatment Fidelity	Beginning	I tell students the purpose of this study and take informed consent using forms		
		Pre tests are conducted in the first week from Vocabulary Knowledge Scales and Productive tests for three groups		
	During the treatment	Regarding technology with pushed output, I email to students six target words every week, from the second week until the sixth week		
		Respecting pushed output in class, I provide students with six target words every week, from the second week until the sixth week		
		Concerning non-technology and non-pushed output, I provide students with six target words every week, from the second week until the sixth week		
		I receive students' answers concerning pushed output in class and technology with pushed output, then I provide students with their feedback.		
	Time Spent	I ask students to write a story format by using the given words weekly		
		The time for doing an exercise in class is three hours every week in terms of pushed output and non-pushed output.		
		Regarding the time for doing an exercise with technology, students are expected to finish within 90 minutes, but they have flexibility with their time, which is 24/7.		
	Ending	At the beginning of the seventh week (i.e. after five weeks of treatment), I administer the post-tests to students.		
		I do not provide students with exercises using same words from the end of the seventh week until the beginning of the 11th week.		
		I provide students with delayed posttests at the end of the 11 th week, and then asked the students to fill out the questionnaire.		

Appendix 4: Questionnaire

Students' Attitude and Experience toward studying vocabulary using email

أختي الطالبة:

يوضح الاستبيان آراء المشاركين وخبراتهم في دراسة المفردات باستخدام البريد الإلكتروني كجزء من نهج التعلم المعزز بالتكنولوجيا لاكتساب مفردات جديدة. بخصوص القسم الأول، اقرأ كل فقرة وحدد مقدار ما ينطبق عليك وعلى الرقم الذي يصف أفضل طريقة تفكيرك عادةً، استنادًا إلى الاستجابة الأولى التي تتبادر إلى ذهنك. أما في القسم الثاني، أجب عن الأسئلة المتعلقة برأيك. (لا توجد إجابات صحيحة أو خاطئة)

Section 1: Likert Scales

Answer the following questions on a scale of 1 – 5

Learning vocabulary		Strongly disagree	Disagree	Neutral	agree	Strongly agree
1	I am interested in learning / studying English vocabulary	1	2	3	4	5
2	Learning vocabulary is not important for learning a foreign language.	1	2	3	4	5
3	Five weeks are enough for learning new words	1	2	3	4	5
4	It is not easier to learn new words when they are presented in context.	1	2	3	4	5
5	I can not acquire a large foreign language vocabulary simply by writing a lot.	1	2	3	4	5
6	I study new words and then practise using them.	1	2	3	4	5

Using email		Strongly disagree	Disagree	Neutral	agree	Strongly agree
7	It is easier to contact my instructor through email than other application.	1	2	3	4	5
8	It is easy to download email in my cell phone.	1	2	3	4	
9	Using email helped me access additional info, outside of using my textbooks.	1	2	3	4	5
10	I did not enjoy using an email to learn.	1	2	3	4	5
11	Using the technology (email) did not help me become more confident in my learning.	1	2	3	4	5
12	Using email did not allow me to interact better than in the class.	1	2	3	4	5

Combining vocabulary + email		Strongly disagree	Disagree	Neutral	agree	Strongly agree
13	Learning vocabulary by email is helpful to my learning	1	2	3	4	5
14	Learning vocabulary by email helps me develop a sense of participation.	1	2	3	4	5
15	Learning vocabulary by email makes me understand vocabulary more than classroom-based exercise	1	2	3	4	5

16	Learning vocabulary by email can not improve my skills in written communication	1	2	3	4	5
17	Learning vocabulary by email does not motivate me to learn.	1	2	3	4	5
18	Activities of learning vocabulary by email does not increase the interaction between my teacher and me	1	2	3	4	5
19	I am not satisfied in learning words on the technology-based exercise	1	2	3	4	5
20	Learning vocabulary by email is not time-consuming.	1	2	3	4	5

Section 2: Open-ended Questions

1. How did you feel about the email?

2. Has your knowledge and skills in learning English benefited from the use of email?

a. If Yes, in what ways (Please provide examples):

b. If No, why not? (Please write what kind difficulties you have experienced):

3. What are the advantages and disadvantages of teaching in class without email for studying English vocabulary?

4. What are the advantages and disadvantages of using email for studying English vocabulary?

Appendix 5: SPSS Results

Table 20: Relationship between the total scores for the questionnaire and the gain scores of productive test from pre-testing to post-testing.

		Total score	Gain scores from pre-testing to post-testing
Spearman's rho	Total score	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
		N	54
Gain scores from pre-testing to post-testing		Correlation Coefficient	-.032
		Sig. (2-tailed)	.820
		N	54

Table 21: Relationship between the total scores for the questionnaire and the gain scores of productive test from pre-testing to delayed post-testing.

		Gain scores from pre-testing to delayed post-testing	Total score
Spearman's rho	Gain scores from pre-testing to delayed post-testing	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
		N	54
Total score		Correlation Coefficient	-.222
		Sig. (2-tailed)	.107
		N	54

Table 22: Relationship between the total scores for the questionnaire and the gain scores of Vocabulary Knowledge scales from pre-testing to post-testing.

Correlations

		Gain scores from pre testing to post testing - email	totalscore
Spearman's rho	Gain scores from pre testing to post testing - email	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
		N	54
totalscore		Correlation Coefficient	-.010
		Sig. (2-tailed)	.944
		N	54

Tale 23: Relationship between the total scores for the questionnaire and the gain scores of Vocabulary Knowledge scales from pre-testing to delayed post-testing.

Correlations

			totalscore	Gain scores pre testing to delayed post testing - email
Spearman's rho	totalscore	Correlation Coefficient	1.000	.110
		Sig. (2-tailed)	.	.429
		N	54	54
Gain scores pre testing to delayed post testing - email		Correlation Coefficient	.110	1.000
		Sig. (2-tailed)	.429	.
		N	54	54

Table 24: Mean scores and standard deviations of productive test

Report

conditions		Gain scores from pre testing to post testing	Gain scores from pre testing to delayed post testing
Pushed Email	Mean	14.74	12.13
	N	54	54
	Std. Deviation	5.485	5.006
Pushed Class	Mean	8.80	7.44
	N	54	54
	Std. Deviation	3.552	3.479
Non - Pushed Class	Mean	5.50	4.39
	N	54	54
	Std. Deviation	2.718	2.999
Total	Mean	9.68	7.99
	N	162	162
	Std. Deviation	5.586	5.039

Table 25: Comparison of the productive test score gains from pre-testing to post-testing (pushed class versus non-pushed class)

Mann-Whitney Test

		Ranks			
		conditions	N	Mean Rank	Sum of Ranks
Gain scores from pre testing to post testing	Pushed Class		54	68.17	3681.00
	Non - Pushed Class		54	40.83	2205.00
	Total		108		

Test Statistics^a

Gain scores from pre testing to post testing

Mann-Whitney U	720.000
Wilcoxon W	2205.000
Z	-4.557
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: conditions

Table 26: Comparison of the productive test's score gains from pre-testing to post-testing (pushed email versus pushed class)

Mann-Whitney Test

		Ranks			
		conditions	N	Mean Rank	Sum of Ranks
Gain scores from pre testing to post testing	Pushed Email		54	70.59	3812.00
	Pushed Class		54	38.41	2074.00
	Total		108		

Test Statistics^a

Gain scores from pre testing to post testing

Mann-Whitney U	589.000
Wilcoxon W	2074.000
Z	-5.353
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: conditions

Table 27: Comparison of the productive test's score gains from pre-testing to delayed post-testing (pushed class versus non-pushed class)

Mann-Whitney Test

		Ranks		
	conditions	N	Mean Rank	Sum of Ranks
Gain scores from pre testing to delayed post testing	Pushed Class	54	67.78	3660.00
	Non - Pushed Class	54	41.22	2226.00
	Total	108		

Test Statistics^a

	Gain scores from pre testing to delayed post testing
Mann-Whitney U	741.000
Wilcoxon W	2226.000
Z	-4.442
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: conditions

Table 28: Comparisons of the productive test's score gains from pre-testing to delayed post-testing (pushed email versus pushed class)

Mann-Whitney Test

		Ranks		
	conditions	N	Mean Rank	Sum of Ranks
Gain scores from pre testing to delayed post testing	Pushed Email	54	68.52	3700.00
	Pushed Class	54	40.48	2186.00
	Total	108		

Test Statistics^a

	Gain scores from pre testing to delayed post testing
Mann-Whitney U	701.000
Wilcoxon W	2186.000
Z	-4.665
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: conditions

Table 29: Mean scores and standard deviations of VKS

		Report	
Conditions		gainscores_post	gainscores_de- layedpost
Pushed Email	Mean	1.7959	1.6326
	N	54	54
	Std. Deviation	.23953	.24272
Pushed Class	Mean	1.0081	.8994
	N	54	54
	Std. Deviation	.21372	.22030
No Pushed Class	Mean	.8724	.7726
	N	54	54
	Std. Deviation	.21966	.22034
Total	Mean	1.2255	1.1015
	N	162	162
	Std. Deviation	.46541	.44264

Table 30: Comparison of the vocabulary knowledge scales test's score gains from pre-testing to post-testing (pushed class versus non-pushed class)

Mann-Whitney Test

		Ranks		
gainscores_post	Conditions	N	Mean Rank	Sum of Ranks
	Pushed Class	54	64.22	3468.00
	No Pushed Class	54	44.78	2418.00
	Total	108		

Test Statistics^a

		gainscores_post
Mann-Whitney U		933.000
Wilcoxon W		2418.000
Z		-3.229
Asymp. Sig. (2-tailed)		.001

a. Grouping Variable: Conditions

Table 31: Comparison of the vocabulary knowledge scales test's score gains from pre-testing to post-testing (pushed email versus pushed class)

Mann-Whitney Test

	Ranks			
	Conditions	N	Mean Rank	Sum of Ranks
gainscores_post	Pushed Email	54	81.22	4386.00
	Pushed Class	54	27.78	1500.00
	Total	108		

Test Statistics^a

	gainscores_post
Mann-Whitney U	15.000
Wilcoxon W	1500.000
Z	-8.868
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Conditions

Table 32: Comparison of the vocabulary knowledge scales test's score gains from pre-testing to delayed post-testing (pushed class versus non-pushed class)

Mann-Whitney Test

	Ranks			
	Conditions	N	Mean Rank	Sum of Ranks
gainscores_delayedpost	Pushed Class	54	63.89	3450.00
	No Pushed Class	54	45.11	2436.00
	Total	108		

Test Statistics^a

	gainscores_delayedpost
Mann-Whitney U	951.000
Wilcoxon W	2436.000
Z	-3.118
Asymp. Sig. (2-tailed)	.002

a. Grouping Variable: Conditions

Table 33: Comparisons of the vocabulary knowledge scales test's score gains from pre-testing to delayed post-testing (pushed email versus pushed class)

Mann-Whitney Test

	Ranks			
	Conditions	N	Mean Rank	Sum of Ranks
gainscores_delayedpost	Pushed Email	54	81.00	4374.00
	Pushed Class	54	28.00	1512.00
	Total	108		

Test Statistics^a

gainscores_delayed post	
Mann-Whitney U	27.000
Wilcoxon W	1512.000
Z	-8.795
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Conditions

Appendix 6: The Confirmation for Data Collection at Albaha University

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



KINGDOM OF SAUDI ARABIA
MINISTRY OF EDUCATION
AL-BAHA UNIVERSITY (042)

المملكة العربية السعودية
وزارة التعليم
جامعة الباحة (٠٤٢)

سعادة الملحق الثقافي بلندن حفظه الله

السلام عليكم ورحمة الله وبركاته وبعد،،،

نفيدكم بأن المبتعث/ سعد بن عبد بن سفر الدهيمي البقمي، المبتعث لدرجة الدكتوراه في جامعة نيوكاسل، قد أنهى رحلته العلمية في قسم اللغة الإنجليزية بكلية العلوم والآداب بقلوة في جامعة الباحة، من خلال إجراء دراسة تتعلق باكتساب المفردات الإنجليزية من الفترة ١٤٤١/١/٢ هـ الموافق ٢٠١٩/٩/١ م إلى الفترة ١٤٤١/٣/٢٣ هـ الموافق ٢٠١٩/١١/٢٠ م.

هذا والله ولي التوفيق

رئيس قسم اللغة الإنجليزية


د. أحمد بن إبراهيم السلامي



الرقم : التاريخ : المشفوعات :

تليفون : ٧٧٧٤١١١ - ٧ - ٠٠٩٦٦ فاكس : ٧٧٤٧٢٧٢ - ٧ - ٠٠٩٦٦ الباحة : ص ب (١٩٨٨)
Tel.: 00966 7 7274111 fax: 0966 7 7247272 Al-Baha P.O.Box (1988)

Appendix 7: Examples of SPSS Data Analysis

SPSS Statistics File Edit View Data Transform Analyze Direct Marketing Graphs Utilities Extensions Window Help Tue 15 Feb 19:2

Productive test Gain scores.sav [DataSet1] - IBM SPSS Statistics Data Editor

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	ID	Numeric	8	0		None	None	8	Right	Scale	Input
2	groups	Numeric	8	0		{1, Group 1}...	None	9	Right	Nominal	Input
3	conditions	Numeric	8	0		{1, Pushed E...	None	9	Right	Nominal	Input
4	pretests	Numeric	8	0	Pre tests	None	None	7	Right	Scale	Input
5	posttests	Numeric	8	0	Post tests	None	None	8	Right	Scale	Input
6	Gainscores_pre_post	Numeric	8	0	Gain scores from pre testing to post testing	None	None	16	Right	Scale	Input
7	Delayed_posttests	Numeric	8	0	Delayed Post tests	None	None	15	Right	Scale	Input
8	Gainscores_pre_delayedpost	Numeric	8	0	Gain scores from pre testing to delayed post testing	None	None	21	Right	Scale	Input
9											
10											
11											
12											
13											
14											

VKS test.sav [DataSet2] - IBM SPSS Statistics Data Editor

File Edit View Data Transform Analyze Direct Marketing Graphs Utilities Extensions Window Help

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	ID	Numeric	8	0		None	None	8	Right	Scale	Input
2	group	Numeric	8	0		{1, group 1}...	None	8	Right	Nominal	Input
3	Conditions	Numeric	8	0		{1, Pushed ...	None	14	Right	Nominal	Input
4	pretest_sc...	Numeric	8	2		{1.00, word ...	None	18	Right	Scale	Input
5	posttest_sc...	Numeric	8	2		{1.00, word ...	None	18	Right	Scale	Input
6	gainscores_...	Numeric	8	2		None	None	17	Right	Scale	Input
7	delayedpost...	Numeric	8	2		{1.00, word ...	None	18	Right	Scale	Input
8	gainscores_...	Numeric	8	2		None	None	24	Right	Scale	Input
9											
10											
11											
12											
13											
14											

SPSS Statistics File Edit View Data Transform Analyze Direct Marketing Graphs Utilities Extensions Window Help

Questionnaire.sav [DataSet3] - IBM SPSS Statistics Data Editor

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure	Role
1	likert1	Numeric	8	0	interested in le...	{1, strongly ...	None	8	Right	Scale	Input
2	likert2	Numeric	8	0	Learning vocab...	{1, strongly ...	None	8	Right	Scale	Input
3	likert3	Numeric	8	0	Five weeks are...	{1, strongly ...	None	8	Right	Scale	Input
4	likert4	Numeric	8	0	It is not easier ...	{1, strongly ...	None	8	Right	Scale	Input
5	likert5	Numeric	8	0	I can not acqui...	{1, strongly ...	None	8	Right	Scale	Input
6	likert6	Numeric	8	0	I study new wo...	{1, strongly ...	None	8	Right	Scale	Input
7	likert7	Numeric	8	0	It is easier to c...	{1, strongly ...	None	8	Right	Scale	Input
8	likert8	Numeric	8	0	It is easy to do...	{1, strongly ...	None	8	Right	Scale	Input
9	likert9	Numeric	8	0	Using email he...	{1, strongly ...	None	8	Right	Scale	Input
10	likert10	Numeric	8	0	I did not enjoy ...	{1, strongly ...	None	8	Right	Scale	Input
11	likert11	Numeric	8	0	Using the tech...	{1, strongly ...	None	8	Right	Scale	Input
12	likert12	Numeric	8	0	Using email di...	{1, strongly ...	None	8	Right	Scale	Input
13	likert13	Numeric	8	0	Learning vocab...	{1, strongly ...	None	8	Right	Scale	Input
14	likert14	Numeric	8	0	Learning vocab...	{1, strongly ...	None	8	Right	Scale	Input
15	likert15	Numeric	8	0	Learning vocab...	{1, strongly ...	None	8	Right	Scale	Input
16	likert16	Numeric	8	0	Learning vocab...	{1, strongly ...	None	8	Right	Scale	Input
17	likert17	Numeric	8	0	Learning vocab...	{1, strongly ...	None	8	Right	Scale	Input
18	likert18	Numeric	8	0	Activities of le...	{1, strongly ...	None	8	Right	Scale	Input
19	likert19	Numeric	8	0	I am not satisf...	{1, strongly ...	None	8	Right	Scale	Input
20	likert20	Numeric	8	0	Learning vocab...	{1, strongly ...	None	8	Right	Scale	Input
21	likert2s	Numeric	8	2	likert2s	{1.00, stron...	None	10	Right	Nominal	Input
22	likert4s	Numeric	8	2	likert4s	{1.00, stron...	None	10	Right	Nominal	Input
23	likert5s	Numeric	8	2	likert5s	{1.00, stron...	None	10	Right	Nominal	Input
24	likert10s	Numeric	8	2	likert10s	{1.00, stron...	None	11	Right	Nominal	Input
25	likert11s	Numeric	8	2	likert11s	{1.00, stron...	None	11	Right	Nominal	Input
26	likert12s	Numeric	8	2	likert12s	{1.00, stron...	None	11	Right	Nominal	Input

Appendix 8: Full List of Words with Their Weekly Distribution

Week 1		
Word Set 1	Word Set 2	Word Set 3
Rate	Paradise	Beware
vary	Pleasure	character
wreck	Switch	conscience
Disapprove	Spirit	Evaluate
weep	Envision	Option
Resource	Forgive	Concede

Week 2		
Word Set 1	Word Set 2	Word Set 3
Lecture	Disagree	Pastime
Brag	Moan	Moral
Hint	Accident	Role
Semester	Torment	Soar
Index	Echo	Pinpoint
Cyberspace	Refrain	Rally

Week 3		
Word Set 1	Word Set 2	Word Set 3
Replace	Spark	Combine
Highlight	Conduct	Subject
Edit	Melt	Admonish
Resolution	cultivate	Operate
Essay	Faint	Plea
Surrender	Wage	Intervene

Week 4		
Word Set 1	Word Set 2	Word Set 3
Version	Access	Conceal
Influence	Landmark	Law
Mode	Proclaim	Crime
Enclose	Tend	Offence
Appetite	Resolve	Habitat
Gratitude	Decade	Account

Week 5		
Word Set 1	Word Set 2	Word Set 3
Assist	sour	Shrink
Defy	Smash	Review
Display	Rumour	Classify
Concept	Slap	Construct
Soak	Divine	Isolate
Volunteer	Perished	Oblige

Appendix 9: List of Words

1. Rate
2. vary
3. wreck
4. Disapprove
5. weep
6. Resource
7. Lecture
8. Brag
9. Hint
10. Semester
11. Index
12. Cyberspace
13. Replace
14. Highlight
15. Edit
16. Resolution
17. Essay
18. Surrender
19. Version
20. Influence
21. Mode
22. Enclose
23. Appetite
24. Gratitude
25. Assist
26. Defy
27. Display
28. Concept
29. Soak
30. Volunteer

31. Paradise
32. Pleasure
33. Switch
34. Spirit
35. Envision
36. Forgive
37. Disagree
38. Moan
39. Accident
40. Torment
41. Echo
42. Refrain
43. Spark
44. Conduct
45. Melt
46. cultivate

47. Faint
48. Wage
49. Access
50. Landmark
51. Proclaim
52. Tend
53. Resolve
54. Decade
55. sour
56. Smash
57. Rumour
58. Slap
59. Divine
60. Perished

61. Beware
62. character
63. conscience
64. Evaluate
65. Option
66. Concede
67. Pastime
68. Moral
69. Role
70. Soar
71. Pinpoint
72. Rally
73. Combine
74. Subject
75. Admonish
76. Operate
77. Plea
78. Intervene
79. Conceal
80. Law
81. Crime
82. Offence
83. Habitat
84. Account
85. Shrink
86. Review
87. Classify
88. Construct
89. Isolate
90. Oblige

Appendix 10: Productive Test

Complete the underlined words. The example has been done for you.
He was riding a bicycle.

1. The ra at which these flowers grew was surprisingly fast
2. Because patients' bodies are so different, the effects of the medicine will va.
3. New drivers are more likely to wr their cars than experienced drivers.
4. She disap of my trip to Vienna.
5. The father did not want his family to we for him when he went away to prison.
6. The poor man didn't have the reso to feed himself.
7. Because the island is so warm and beautiful, people call it a para.
8. It was a plea to meet you.
9. Windows that can't be broken and can swi from opaque to clear.
10. His strong spi could not be hurt from mean comments.
11. I can't envi you as a politician.
12. Sandra forg Peter after he said he was sorry.
13. You should bew of the traffic when crossing the road.
14. My brother has a very friendly and cheerful char
15. Why did you steal the woman's bag? Don't you have a consc?
16. The team eval the success of the project.
17. He had to choose the blue car because there weren't any other opt.
18. The student conc that he had cheated on the test.
19. We went to a lec about birds.
20. His proud sister br about how good she is at sports.
21. Brennan offered a hi of information.
22. We must finish all these curricula in this seme.
23. If you look in the ind, you'll find the right page number.
24. I didn't receive your email. It probably got lost in cyber.
25. The two friends disa about which game was better.
26. I am tired of hearing you mo and groan
27. Many people were hurt in the boating acci
28. He couldn't sleep at night because bad dreams torm him.
29. She thought someone was calling to her from the other cliff, but it was just the ec of her voice.
30. The doctor asked Mary to refr from eating fast food as part of her diet.
31. My favourite pas is listening to music.
32. The mor of the story is to be nicer to people.
33. You need to accept your ro within the organisation
34. A bird soa above the valley.

35. The hiker always carried a compass and map, so he could **pinp** _____ his location in the wild.
36. The school had a **ral** _____ in the gym to support the basketball team.
37. We need to **rep** _____ the whole unit.
38. You should **high** _____ these words with a yellow pen.
39. You **ed** _____ an essay to reduce the word count.
40. I made a **resol** _____ halfway through the school year.
41. Geology is my favourite subject, so I wrote an **es** _____ about rocks.
42. The thief **surre** _____ the money to the police when he was caught.
43. There were **spa** _____ flying out of the computer.
44. She was punished for her bad **cond** _____.
45. If you put the butter near the fire, it will **me** _____.
46. My mother **culti** _____ several species of flowers as a hobby.
47. In the first aid class, we learned what to do if someone **fai** _____.
48. The **wag** _____ I receive from my job are really great!
49. The scientists wanted to find a cure for the sickness, so they **com** _____ the chemicals.
50. The **sub** _____ of Marco's speech was the economy.
51. She **admo** _____ the student for talking during the test.
52. Joe **oper** _____ this large machine.
53. The poor, hungry man made a **pl** _____ for food.
54. The students argued until the teacher **inter** _____.
55. She read the students British **ver** _____ of the Chinese fairy tale.
56. My friend **influ** _____ my decision to attend Terrance University.
57. Mother turned the TV to quiet **mo** _____ while she talked on the phone.
58. The cows in the field were **encl** _____ by a fence.
59. Tom has a big **appe** _____. He eats all the time.
60. The kids showed Aunt Tess much **grat** _____ for visiting them.
61. The manager was the only person with **acc** _____ to the password.
62. The tall tree was used as a **land** _____ for people to find the road to the inn.
63. The army general **procl** _____ that the war was won.
64. My mom **ten** _____ to buy me the perfect gift each Christmas.
65. She **reso** _____ the problem with her children by giving them both a toy.
66. She celebrated her three **dec** _____ of work with the company.
67. You should **con** _____ your money so no one can take it from you.
68. The students learned about different **la** _____ during social studies class.
69. Police quickly arrived at the scene of the **cri** _____.
70. He was put in jail for two days for the **offe** _____.
71. Frogs are often found in a wet **habi** _____, such as near a lake, river, or pond.
72. After I paid for the new car, my bank **acco** _____ was nearly empty.
73. Andrew **assi** _____ me with my homework.
74. The students got into trouble for **def** _____ their teacher's rules.
75. The museum **disp** _____ many wonderful paintings.

76. I learned some **conc**_____ of molecules before working in the science lab.
77. This pan was so dirty that I had to **so**_____ it overnight.
78. Many people **volun**_____ to help the adults learn to read.
79. Hot weather **sou**_____ milk.
80. Jacob **smas**_____ the window with a rock.
81. Kevin was spreading **rum**_____ about Marcia to everyone.
82. Out of anger, Helen **sla**_____ Eunice on the face.
83. Legends say that music was given to men as a **div**_____ gift from the gods.
84. My whole family **peri**_____ in the fire.
85. If you wash this silk shirt in hot water, it will **shr**_____
86. The government ordered a careful **rev**_____ of the economic situation.
87. The biologist **class**_____ the plant as a completely new species.
88. The men used wood and metal to **cons**_____ a house.
89. The teacher **isol**_____ the bad child from the class before talking with her.
90. If I wanted to have playtime, I was **obli**_____ to clean my room once a week.

Appendix 11: Vocabulary Knowledge Scales Test (VKS)

Choose the suitable answer by circling the number. If you choose number 3, provide a translation or a synonym. If you choose number 4, provide an example using the word.

	I don't know what this word means	I have seen this word before, but I can't remember.	I know this word. It means (Synonyms or translation)	I can use this word in a sentence. (Write a sentence)
Rate	1	2	3	4
e.g. ----- -----				
Vary	1	2	3	4
e.g. ----- -----				
Wreck	1	2	3	4
e.g. ----- -----				
Disapprove	1	2	3	4
e.g. ----- -----				
Weep	1	2	3	4
e.g. ----- -----				
Resource	1	2	3	4
e.g. ----- -----				
Paradise	1	2	3	4
e.g. ----- -----				
Pleasure	1	2	3	4
e.g. ----- -----				
Switch	1	2	3	4
e.g. ----- -----				
Spirit	1	2	3	4
e.g. ----- -----				
Envision	1	2	3	4
e.g. ----- -----				
Forgive	1	2	3	4
e.g. ----- -----				

	I don't know what this word means	I have seen this word before, but I can't remember.	I know this word. It means (Synonyms or translation)	I can use this word in a sentence. (Write a sentence)
Beware	1	2	3	4
e.g. ----- -----				
Character	1	2	3	4
e.g. ----- -----				
Conscience	1	2	3	4
e.g. ----- -----				
Evaluate	1	2	3	4
e.g. ----- -----				
Option	1	2	3	4
e.g. ----- -----				
Concede	1	2	3	4
e.g. ----- -----				
Lecture	1	2	3	4
e.g. ----- -----				
Brag	1	2	3	4
e.g. ----- -----				
Hint	1	2	3	4
e.g. ----- -----				
Semester	1	2	3	4
e.g. ----- -----				
Index	1	2	3	4
e.g. ----- -----				
Cyberspace	1	2	3	4
e.g. ----- -----				

	I don't know what this word means	I have seen this word before, but I can't remember.	I know this word. It means (Synonyms or translation)	I can use this word in a sentence. (Write a sentence)
Disagree	1	2	3	4
e.g. ----- -----				
Moan	1	2	3	4
e.g. ----- -----				
Accident	1	2	3	4
e.g. ----- -----				
Torment	1	2	3	4
e.g. ----- -----				
Echo	1	2	3	4
e.g. ----- -----				
Refrain	1	2	3	4
e.g. ----- -----				
Pastime	1	2	3	4
e.g. ----- -----				
Moral	1	2	3	4
e.g. ----- -----				
Role	1	2	3	4
e.g. ----- -----				
Soar	1	2	3	4
e.g. ----- -----				
Pinpoint	1	2	3	4
e.g. ----- -----				
Rally	1	2	3	4
e.g. ----- -----				

	I don't know what this word means	I have seen this word before, but I can't remember.	I know this word. It means (Synonyms or translation)	I can use this word in a sentence. (Write a sentence)
Replace	1	2	3	4
e.g. ----- -----				
Highlight	1	2	3	4
e.g. ----- -----				
Edit	1	2	3	4
e.g. ----- -----				
Resolution	1	2	3	4
e.g. ----- -----				
Essay	1	2	3	4
e.g. ----- -----				
Surrender	1	2	3	4
e.g. ----- -----				
Spark	1	2	3	4
e.g. ----- -----				
Conduct	1	2	3	4
e.g. ----- -----				
Melt	1	2	3	4
e.g. ----- -----				
cultivate	1	2	3	4
e.g. ----- -----				
Faint	1	2	3	4
e.g. ----- -----				
Wage	1	2	3	4
e.g. ----- -----				

	I don't know what this word means	I have seen this word before, but I can't remember.	I know this word. It means (Synonyms or translation)	I can use this word in a sentence. (Write a sentence)
Combine	1	2	3	4
e.g. ----- -----				
Subject	1	2	3	4
e.g. ----- -----				
Admonish	1	2	3	4
e.g. ----- -----				
Operate	1	2	3	4
e.g. ----- -----				
Plea	1	2	3	4
e.g. ----- -----				
Intervene	1	2	3	4
e.g. ----- -----				
Version	1	2	3	4
e.g. ----- -----				
Influence	1	2	3	4
e.g. ----- -----				
Mode	1	2	3	4
e.g. ----- -----				
Enclose	1	2	3	4
e.g. ----- -----				
Appetite	1	2	3	4
e.g. ----- -----				

	I don't know what this word means	I have seen this word before, but I can't remember.	I know this word. It means (Synonyms or translation)	I can use this word in a sentence. (Write a sentence)
Gratitude	1	2	3	4
e.g. ----- -----				
Access	1	2	3	4
e.g. ----- -----				
Landmark	1	2	3	4
e.g. ----- -----				
Proclaim	1	2	3	4
e.g. ----- -----				
Tend	1	2	3	4
e.g. ----- -----				
Resolve	1	2	3	4
e.g. ----- -----				
Decade	1	2	3	4
e.g. ----- -----				
Conceal	1	2	3	4
e.g. ----- -----				
Law	1	2	3	4
e.g. ----- -----				
Crime	1	2	3	4
e.g. ----- -----				
Offence	1	2	3	4
e.g. ----- -----				

	I don't know what this word means	I have seen this word before, but I can't remember.	I know this word. It means (Synonyms or translation)	I can use this word in a sentence. (Write a sentence)
Habitat	1	2	3	4
e.g. ----- -----				
Account	1	2	3	4
e.g. ----- -----				
Assist	1	2	3	4
e.g. ----- -----				
Defy	1	2	3	4
e.g. ----- -----				
Display	1	2	3	4
e.g. ----- -----				
Concept	1	2	3	4
e.g. ----- -----				
Soak	1	2	3	4
e.g. ----- -----				
Volunteer	1	2	3	4
e.g. ----- -----				
sour	1	2	3	4
e.g. ----- -----				
Smash	1	2	3	4
e.g. ----- -----				

	I don't know what this word means	I have seen this word before, but I can't remember.	I know this word. It means (Synonyms or translation)	I can use this word in a sentence. (Write a sentence)
Rumour	1	2	3	4
e.g. ----- -----				
Slap	1	2	3	4
e.g. ----- -----				
Divine	1	2	3	4
e.g. ----- -----				
Perish	1	2	3	4
e.g. ----- -----				
Shrink	1	2	3	4
e.g. ----- -----				
Review	1	2	3	4
e.g. ----- -----				
Classify	1	2	3	4
e.g. ----- -----				
Construct	1	2	3	4
e.g. ----- -----				
Isolate	1	2	3	4
e.g. ----- -----				
Oblige	1	2	3	4
e.g. ----- -----				

Appendix 12: Examples of Data Analysis Using SPSS (VKS Dataset)

VKS test.sav [DataSet2] - IBM SPSS Statistics Data Editor

File Edit View Data Transform Analyze Direct Marketing Graphs Utilities Extensions Window Help

	ID	group	Conditions	pretest_scores	posttest_scores	gainscores_post	delayedpost_scores	gainscores_delayedpost	var
1	1	1	1	1.36	3.33	1.97	3.16	1.80	
2	1	1	2	1.40	2.33	.93	2.23	.83	
3	1	1	3	1.53	2.13	.60	2.06	.53	
4	2	1	1	1.50	3.03	1.53	2.93	1.43	
5	2	1	2	1.43	2.70	1.27	2.60	1.17	
6	2	1	3	1.20	2.10	.90	2.03	.83	
7	3	1	1	1.46	3.16	1.70	3.10	1.64	
8	3	1	2	1.53	2.66	1.13	2.40	.87	
9	3	1	3	1.66	2.30	.64	2.26	.60	
10	4	1	1	1.46	3.06	1.60	2.96	1.50	
11	4	1	2	1.53	2.13	.60	1.96	.43	
12	4	1	3	1.56	2.30	.74	2.23	.67	
13	5	1	1	1.46	2.86	1.40	2.66	1.20	
14	5	1	2	1.50	2.36	.86	2.20	.70	
15	5	1	3	1.63	2.30	.67	2.20	.57	
16	6	1	1	1.09	3.20	2.11	3.00	1.91	
17	6	1	2	1.53	2.60	1.07	2.43	.90	
18	6	1	3	1.53	2.13	.60	2.01	.48	
19	7	1	1	1.43	3.10	1.67	2.80	1.37	
20	7	1	2	1.60	2.43	.83	2.26	.66	
21	7	1	3	1.76	2.40	.64	2.26	.50	
22	8	1	1	1.03	3.33	2.30	3.03	2.00	
23	8	1	2	1.43	2.43	1.00	2.20	.77	
24	8	1	3	1.56	2.26	.70	2.20	.64	
25	9	1	1	1.46	3.20	1.74	3.10	1.64	
26	9	1	2	1.70	2.80	1.10	2.73	1.03	
27	9	1	3	1.53	2.30	.77	2.02	.49	
28	10	1	1	1.43	3.20	1.77	2.90	1.47	
29	10	1	2	1.50	2.73	1.23	2.63	1.13	
30	10	1	3	1.56	2.36	.80	2.30	.74	
31	11	1	1	1.46	3.20	1.74	2.96	1.50	
32	11	1	2	1.40	2.33	.93	2.34	.94	
33	11	1	3	1.33	2.23	.90	2.23	.90	
34	12	1	1	1.01	3.03	2.02	2.70	1.69	
35	12	1	2	1.60	2.36	.76	2.16	.56	
36	12	1	3	1.73	2.43	.70	2.30	.57	
37	13	1	1	1.53	3.43	1.90	3.16	1.63	

Data View Variable View

Appendix 13: Student Writing Sample in the Pushed Email Condition

اكتب الكلمات الستة التالية في قصة قصيرة باللغة الإنجليزية ويجب أن تحتوي القصة على جميع الكلمات

Word Set 3
Shrink
Review
Classify
Construct
Isolate
Oblige

At the first year of my university at biology department before I moving to English department to study I was studying subject called biology classification I studied the behavior of a certain types of animals. I had observed that their shrink population and I wanted to find out why. I began to review all the data I had collected and classified the animals into different groups based on their behavior. I constructed an expectation that the isolated animals from their natural habitat due to human activities.

To see my expectation, I set up an experiment to notice the animals in a controlled environment, to get their natural habitat. I found my expectation was correct, the isolated animals, affecting their population. I knew I had to take action to save the animal, and I felt obliged to inform the public about my findings.

I shared that with the department to help animals' habitat and keep their isolation. I learned that it's important to classify and construct theories. Studing these types of animals are great for any student.

Group 1 Student code 7

Commented [FA13]: Corrected sentence: I had observed that their population was shrinking and I wanted to find out why.

Feedback: The position of the word "shrink" has been corrected to its appropriate form "shrinking". "Shrinking" is a present participle form of the verb, which is needed to show the continuous action of the population decreasing. This revised sentence reads more clearly and accurately conveys the intended meaning.

Commented [FA14]: Corrected sentence: I constructed an expectation that the animals were becoming isolated from their natural habitat due to human activities.

Feedback: The position of the word "isolated" has been corrected to its appropriate place in the sentence, which is after "the animals". This revised sentence reads more clearly and accurately conveys the intended meaning.

Commented [FA15]: Corrected sentence: I found my expectation was correct, affecting their population, the isolated animals.

Feedback: The position of the phrase "the isolated animals" has been moved to the end of the sentence, after the comma, to correctly modify the subject of the sentence "affecting their population." This revised sentence reads more clearly and accurately conveys the intended meaning.

Researcher notes and codes

Lexical choice errors

1. Combination
e.g. "I had observed that their shrink population".
(I had observed that their population was shrinking)

3. Verb forms
e.g. "I constructed an expectation that the isolated animals from their natural habitat due to human activities".
(I constructed an expectation that human activities had isolated the animals from their natural habitat).

Appendix 14: Student Writing Sample in the Pushed Class Condition

ID: 21

G2

اكتب الكلمات الستة التالية في قصة قصيرة باللغة الإنجليزية ويجب أن تحتوي القصة على جميع الكلمات

Word Set 2
Spark
Conduct
Melt
cultivate
Faint
Wage

- 1. Correct it "to melt"
- 2. Add "to" before "eager" to make the sentence more clear.

Raja found it hard to spark her interest in learning and ~~she~~ felt faint when becoming conducting conversations in the language of English. She knew she had to cultivate her language skills, but she wasn't sure how. She decided to wage a challenge on herself to improve her skills. She listened to English music, watched TV movies, and read books in English. She was surprised to find that her language ~~skills~~ skills began ^① in melting and improve as she became more comfortable with the language. With her skills, she is confident to talk in English and ^② eager to continue her learning ~~journey~~ journey. She knew that with continued practice, she could achieve her language goals.

Researcher notes and codes

Lexical choice errors

- 1. Individual lexical items
e.g. She decided to "wage" a challenge on herself to improve her skills.
(take up)
- 3. Individual lexical items
e.g. She was surprised to find that her language skills "began in melting and improve as she became" more comfortable with the language.
(.. began to improve as she became ..)

Appendix 15: Student Writing Sample in the Non-Pushed Class Condition

ID: 7

G1

اكتب الكلمات الستة التالية في جمل باللغة الإنجليزية ويجب أن تحتوي الجمل على جميع الكلمات

Word Set 2
sour
Smash
Rumour
Slap
Divine
Perished

Researcher notes and codes

Lexical choice errors	Lexical form errors
1. Combination e.g. The flowers in the garden "perished of" because it didn't rain for a long. (died)	2. A spelling error I tried a lemon for the first time, and it was too sourd for me. (sour)

1. I tried a lemon for the first time, and it was too sourd for me.
2. My little sister likes to smash toys when she is angry.
3. There was a rumour at Gilwah college that the dean is learing.
4. I slap my friend where we playing a cards game.
5. The Masjad was a divine place to pray and workshop.
6. The flowers in th garden perished of because it did not rain for long.

Appendix 16: Error Categorisation and Coding Procedures

Example sentence (Target words with red lines)	Code	Explanation	Check with two native speakers	ChatGPT alternative words
He didn't always heed the warnings of beware of people who wanted to take advantage of him.	Lexical choice error - Combination	Lexical choice errors of combination occur when users choose the wrong word for their intended meaning. Lexical errors can misinterpret the message.	Done	"He didn't always heed the warnings of scores of people who wanted to take advantage of him." "He didn't always heed the warnings of countless people who wanted to take advantage of him." "He didn't always heed the warnings of numerous people who wanted to take advantage of him." "He didn't always heed the warnings of many people who wanted to take advantage of him." "He didn't always heed the warnings of a multitude of people who wanted to take advantage of him."
Ahmad knew he had all the options before making a decision to evaluate .	Lexical choice error - Combination	The error involves lexical choices. "to evaluate" should come after "had." It is not a specific word that is incorrect, but rather the placement of "to evaluate" after "had".	Done	"Ahmad knew he had all the options before making a decision to proceed." "Ahmad knew he had all the options before making a decision to act." "Ahmad knew he had all the options before making a decision to choose." "Ahmad knew he had all the options before making a decision to proceed further." "Ahmad knew he had all the options before making a decision to move forward."
They often receive a low rate on their home works and exams	Lexical choice error - Individual lexical items	It's a lexical choice error, specifically choosing the right words for the intended meaning or context. This correction uses "grade" instead of "rate." Errors may affect communication clarity, accuracy, and appropriateness.	Done	"They often receive a low grade on their homework and exams." "They often receive a low score on their homework and exams." "They often receive a low mark on their homework and exams." "They often receive a low evaluation on their homework and exams." "They often receive a low assessment on their homework and exams."
When their teacher disapprove of their work in front of the whole class	Lexical form error - Verb forms	Using incorrect verb tenses, such as "their teacher disapprove" instead of "their teacher disapproves," constitutes the error. These errors can have a negative effect on the intelligibility and content of the sentence.	Done	"When their teacher critiques their work in front of the whole class." "When their teacher evaluates their work in front of the whole class." "When their teacher assesses their work in front of the whole class." "When their teacher reviews their work in front of the whole class." "When their teacher analyzes their work in front of the whole class."
I feel faints after stand in the sun for too long.	Lexical form error - Verb forms	There is a lexical form error of verb form in the sentence. The verb "faints" should be in the base form "faint" because it follows a modal verb "feel".	Done	"I feel exhausted after standing in the sun for too long." "I feel drained after standing in the sun for too long." "I feel fatigued after standing in the sun for too long." "I feel tired after standing in the sun for too long." "I feel weary after standing in the sun for too long."
She began highlight the words	Lexical form error - Verb forms	The lexical choice error in the sentence "She began highlight the words" lies in the verb form used. The correct verb form should be "highlighting" instead of "highlight."	Done	"She began reciting the words." "She began uttering the words." "She began speaking the words." "She began repeating the words." "She began articulating the words."
After editing, Sarah was able to see resolution to her writing	Lexical choice error - Individual lexical items	It's a lexical choice error, specifically choosing the right words for the intended meaning or context. This correction uses "improvement" instead of "resolution". Errors may affect communication clarity, accuracy, and appropriateness.	Done	"After editing, Sarah was able to see improvements to her writing." "After editing, Sarah was able to see enhancements to her writing." "After editing, Sarah was able to see changes to her writing." "After editing, Sarah was able to see refinements to her writing." "After editing, Sarah was able to see revisions to her writing."
If the combine does not do their efforts	Lexical choice error - Combination	A lexical choice error in the given sentence occurs when the word "combine" is used as a noun instead of a verb. The correct usage would be to use "combine" as a verb. Additionally, the pronoun "their" should be used to refer to a plural noun, indicating the collective efforts of multiple individuals. Here is the corrected sentence: "If they do not combine their efforts."	Done	"If the team does not do their efforts." "If the group does not do their efforts." "If the organization does not do their efforts." "If the company does not do their efforts." "If the committee does not do their efforts."
The flowers in the garden perished of because it didn't rain for a long.	Lexical choice error - Combination	The lexical choice error in the given sentence occurs with the word "perished". The word "perished" means to die or be destroyed, typically as a result of extreme conditions or lack of sustenance. However, in the context of flowers in a garden, "perished" may not be the most appropriate word choice. It implies complete destruction or death, which may not accurately reflect the situation of the flowers. A more suitable word choice in this context could be "wilted" or "died."	Done	"The flowers in the garden wilted because it didn't rain for a long time." "The flowers in the garden withered because it didn't rain for a long time." "The flowers in the garden dried out because it didn't rain for a long time." "The flowers in the garden suffered because it didn't rain for a long time." "The flowers in the garden deteriorated because it didn't rain for a long time."

Example sentence (Target words with red lines)	Code	Explanation	Check with two native speakers	ChatGPT alternative words
The flowers in the garden perished of because it didn't rain for a long.	Lexical choice error - Combination	The lexical choice error in the given sentence occurs with the word "perished". The word "perished" means to die or be destroyed, typically as a result of extreme conditions or lack of sustenance. However, in the context of flowers in a garden, "perished" may not be the most appropriate word choice. It implies complete destruction or death, which may not accurately reflect the situation of the flowers. A more suitable word choice in this context could be "wilted" or "died."	Done	"The flowers in the garden wilted because it didn't rain for a long time." "The flowers in the garden withered because it didn't rain for a long time." "The flowers in the garden dried out because it didn't rain for a long time." "The flowers in the garden suffered because it didn't rain for a long time." "The flowers in the garden deteriorated because it didn't rain for a long time."
I tried a lemon for the first time, and it was too sourd for me.	Lexical form errors - a spelling error	"Sourd" is misspelt in the sentence. It's "sour." Adding a "d" to the word caused the error. Spelling mistakes like this can make a word unrecognisable or confusing. Writing clearly requires orthographic accuracy. Spelling mistakes can confuse readers. In this case, misspelling "sourd" may confuse the reader.	Done	"I tried a lemon for the first time, and it was too sour for me." "I tried a lemon for the first time, and it was too tart for me." "I tried a lemon for the first time, and it was too acidic for me." "I tried a lemon for the first time, and it was too tangy for me." "I tried a lemon for the first time, and it was too sharp for me."
My teacher announced that they were looking for volunteers and assists with a school project that required strong English skills.	Lexical choice error - Combination	Lexical choice errors of combination occur when users choose the wrong word for their intended meaning. Lexical errors can misinterpret the message.	Done	"My teacher announced that they were looking for volunteers and assistance with a that required strong English skills." "My teacher announced that they were looking for volunteers and help with a school project that required strong English skills." "My teacher announced that they were looking for volunteers and support with a school project that required strong English skills." "My teacher announced that they were looking for volunteers and collaboration with a school project that required strong English skills." "My teacher announced that they were looking for volunteers and participation with a school project that required strong English skills."
soak as much knowledge as I could and volunteer to help.	Lexical choice error - Individual lexical items	It's a lexical choice error, specifically choosing the right words for the intended meaning or context. This correction uses "absorb" instead of "soak". Errors may affect communication clarity, accuracy, and appropriateness.	Done	"Acquire as much knowledge as I could and volunteer to help." "Gain as much knowledge as I could and volunteer to help." "Obtain as much knowledge as I could and volunteer to help." "Absorb as much knowledge as I could and volunteer to help." "Accumulate as much knowledge as I could and volunteer to help."
I had observed that their shrink population	Lexical choice error - Combination	Lexical choice error of combination occurs when users choose the wrong word for their meaning. Your sentence uses the verb "shrink" as a noun. This confuses the sentence's meaning. "Shrinking" is the correct adjective for "population." Thus, the sentence implies a shrinking population. You caught and fixed your lexical error.	Done	"I had observed that their growing population." "I had observed that their declining population." "I had observed that their increasing population." "I had observed that their stable population." "I had observed that their fluctuating population."
I constructed an expectation that the isolated animals from their natural habitat due to human activities	Lexical form error - Verb forms	Lexical form errors occur when a word or part of a word does not follow target language rules or patterns. Spelling, prefixes, suffixes, and word formation are examples. The adjective "isolated" should be a past participle verb. "Isolated" means "separated" or "minimal contact." "Isolate" means "separate from others" or "minimise contact with others". Corrected sentence: I constructed an expectation that human activities had isolated the animals from their natural habitat.	Done	"I constructed an expectation that the endangered animals from their natural habitat were isolated." "I constructed an expectation that the displaced animals from their natural habitat were isolated." "I constructed an expectation that the threatened animals from their natural habitat were isolated." "I constructed an expectation that the migratory animals from their natural habitat were isolated." "I constructed an expectation that the vulnerable animals from their natural habitat were isolated."
The prices would varying greatly from one day to day.□	Lexical form error - Verb forms	Lexical form Verb form errors occur when a word or part does not follow target language rules. "Varying" is misused. The sentence's main verb requires a base or infinitive form. "Vary" is the base form, and "to vary" is the infinitive. Corrected sentence: The prices would vary greatly from one day to another.	Done	"The prices would fluctuate greatly from one day to day." "The prices would vary greatly from one day to day." "The prices would change greatly from one day to day." "The prices would differ greatly from one day to day." "The prices would swing greatly from one day to day."

Peter learned the importance of forgive and let go of his negative thoughts.	Lexical form error - derivational errors	When prefixes or suffixes are added or changed, derivational errors occur. Use "unpossible" instead of "impossible" or "happyness" instead of "happiness". "Forgive" is a derivational error because it lacks "-ness," which makes it a noun. Nouns, not verbs, follow "of." "Forgiveness"—"the act of forgiving"—is correct.	Done	"Peter learned the importance of positivity and let go of his negative thoughts." "Peter learned the importance of optimism and let go of his negative thoughts." "Peter learned the importance of resilience and let go of his negative thoughts." "Peter learned the importance of self-reflection and let go of his negative thoughts." "Peter learned the importance of mindfulness and let go of his negative thoughts."
The teacher had to beware of the plagiarism	Lexical choice error - Individual lexical items	Lexical choice errors of individual lexical items occur when a writer uses the wrong word or phrase in a particular context. Beware means to avoid danger. This doesn't fit the sentence's context about the teacher's plagiarism awareness. Be aware, which means to understand, is better.	Done	"The teacher had to accuse the plagiarism." "The teacher had to address the plagiarism." "The teacher had to confront the plagiarism." "The teacher had to handle the plagiarism." "The teacher had to deal with the plagiarism."
My teacher asks me to give rate to book	Lexical form error - Verb forms	Using the wrong word form in a context is a lexical form error. Rate is a noun or verb that measures or evaluates something. However, the sentence is about giving book feedback. Rating—a noun for an opinion or assessment—is better. Therefore, the correct sentence is: My teacher asks me to give a rating to the book.	Done	"My teacher asks me to give a title to the book." "My teacher asks me to give a review to the book." "My teacher asks me to give feedback to the book." "My teacher asks me to give an analysis to the book." "My teacher asks me to give a rating to the book."
He could cultivate the perfect amount of heat to create the strongest swords	Lexical choice error - Individual lexical items	Lexical choice errors occur when writers use the wrong word or phrase in a particular context. "Cultivate" means to grow or improve something, usually plants or crops. It clashes with "heat," which cannot be grown or improved. Generate—to create—is another option. The sentence would then read: He could generate the perfect amount of heat to create the strongest swords. These errors may affect language naturalness, fluency, and idiom.	Done	"He could harness the perfect amount of heat to create the strongest swords." "He could control the perfect amount of heat to create the strongest swords." "He could manipulate the perfect amount of heat to create the strongest swords." "He could regulate the perfect amount of heat to create the strongest swords." "He could manage the perfect amount of heat to create the strongest swords."
The losing team had to surrender the game to the winning one.	Lexical choice error - Individual lexical items	Lexical choice errors occur when writers choose words or phrases that don't fit the sentence's meaning or tone. "Surrender" means giving up under pressure, while "concede" means conceding defeat or accepting a better argument. The losing team accepted the game's outcome, so a better word would be "concede", which shows respect and sportsmanship. These errors may affect how natural, fluent, and idiomatic the language sounds to the reader.	Done	"The losing team had to concede the game to the winning one." "The losing team had to surrender the game to the winning one." "The losing team had to yield the game to the winning one." "The losing team had to relinquish the game to the winning one." "The losing team had to hand over the game to the winning one."
The teachers agreed and they started to operate on a plan to help them	Lexical choice error - Individual lexical items	Operate means to perform a task with skill. "Work" means to exert effort or complete a task with a goal. "Operate on a plan" implies that the plan is being altered, like surgery. "Work on a plan," which implies execution, is better.	Done	"The teachers agreed and they started to collaborate on a plan to help them." "The teachers agreed and they started to work on a plan to help them." "The teachers agreed and they started to brainstorm on a plan to help them." "The teachers agreed and they started to develop a plan to help them." "The teachers agreed and they started to focus on a plan to help them."