

T.C.
BAHCESEHIR UNIVERSITY
GRADUATE SCHOOL
ENGLISH LANGUAGE EDUCATION DEPARTMENT

**DESIGNING A SIMULATION-BASED AVIATION ENGLISH TRAINING:
THE EXPLORATION OF ITS EFFECTS ON THE ENGLISH SPEAKING
ANXIETY, WILLINGNESS TO COMMUNICATE, VOCABULARY
DEVELOPMENT, AND READBACK PERFORMANCE OF TURKISH
STUDENT PILOTS**

Ph.D THESIS
GÖKHAN DEMİRDÖKEN

ISTANBUL 2023

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Ph.D THESIS

THESIS ADVISOR

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ISTANBUL 2023



T.C.
BAHCESEHIR UNIVERSITY
GRADUATE SCHOOL

DOCTORAL THESIS APPROVAL FORM

Program Name:	ENGLISH LANGUAGE EDUCATION
Student's Name and Surname:	GÖKHAN DEMİRDÖKEN
Name of The Thesis:	DESIGNING A SIMULATION-BASED AVIATION ENGLISH TRAINING: THE EXPLORATION OF ITS EFFECTS ON THE ENGLISH SPEAKING ANXIETY, WILLINGNESS TO COMMUNICATE, VOCABULARY DEVELOPMENT, AND READBACK PERFORMANCE OF TURKISH STUDENT PILOTS
Thesis Defense Date:	09.01.2024

This thesis has been approved by the Graduate School which has fulfilled the necessary conditions as Doctoral thesis.

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ABSTRACT

DESIGNING A SIMULATION-BASED AVIATION ENGLISH TRAINING: THE
EXPLORATION OF ITS EFFECTS ON THE ENGLISH SPEAKING ANXIETY,
WILLINGNESS TO COMMUNICATE, VOCABULARY DEVELOPMENT, AND
READBACK PERFORMANCE OF TURKISH STUDENT PILOTS

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Doctor of Philosophy Program in English Language Education

Supervisor: Prof. Dr. Derin ATAY

January 2024, 120 pages

Aviation English is an important and significant field of research in English for Specific Purposes for the attainment of English language proficiency among student pilots. A simulation-based Aviation English course was designed and implemented in the aviation context. The effects of the simulation-based training on the readback performance, willingness to communicate, English speaking anxiety, and vocabulary development of Turkish student pilots were explored. Accordingly, a mixed-methods sequential explanatory research was designed, and data were collected from 21 ab-initio pilots enrolled in the Pilotage Training program of a foundation university in Türkiye by means of the WTC and ESA scales, a vocabulary knowledge test, readback performance tasks, and a focus-group interview. The quantitative results showed that participants significantly improved their willingness to communicate in L2 and readback performance as well as their vocabulary knowledge over the course of a semester. Also, it was found that participants' English speaking anxiety levels decreased significantly. With regard to the qualitative results, it was concluded that simulation-based training was an innovative and effective method for student pilots. However, there was still room for improvement in terms of the technology infrastructure and course design. The current study has made a significant contribution to the Aviation English research field by reporting on the simulation-based Aviation English training, which also makes it a pioneering study for future research into this

field. The implications for ESP practitioners and stakeholders in the aviation industry as well as suggestions for future research were provided at the end of the study.

Keywords: ESP, Aviation English, Willingness to communicate, English speaking anxiety, Readback performance, Vocabulary development, Simulation

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ÖZ

SİMÜLASYON-TEMELLİ HAVACILIK İNGİLİZCESİ DERSİ TASARIMI:
EĞİTİMİN PİLOT ADAYLARININ İNGİLİZCE KONUŞMA KAYGISI, İKİNCİ
DİLDE İLETİŞİM KURMA İSTEKLİLİĞİ, KELİME ÖĞRENİMİ VE GERİ
OKUMA PERFORMANSLARI ÜZERİNDEKİ ETKİSİNİN İNCELENMESİ

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İngiliz Dili Eğitimi Doktora Programı

Tez Danışmanı: Prof. Dr. Derin ATAY

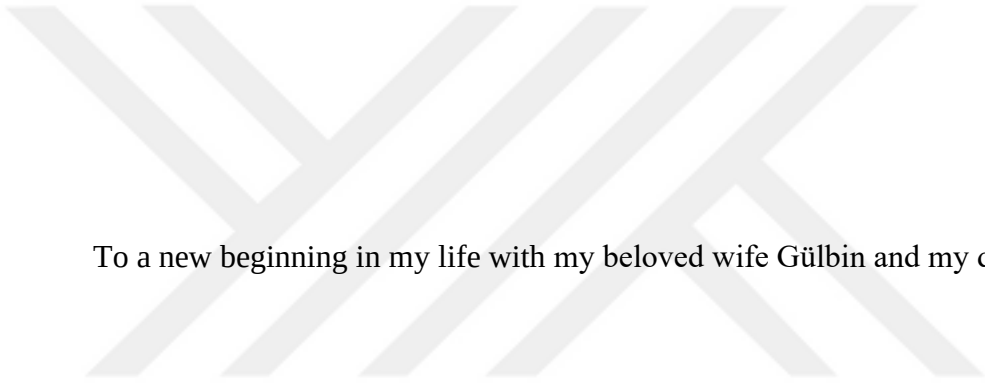
Ocak 2024, 120 sayfa

Havacılık İngilizcesi, öğrenci pilotlar arasında İngilizce dil yeterliliğinin kazanılması için Özel Amaçlı İngilizce (ESP) alanında önemli ve kayda değer bir araştırma alanıdır. Bu kapsamda simülasyon temelli bir Havacılık İngilizcesi dersi tasarlandı ve uygulandı. Simülasyon temelli İngilizce eğitiminin Türk pilot adaylarının geri okuma performansı, ikinci dilde iletişim kurma istekliliği, İngilizce konuşma kaygısı ve kelime öğrenimi üzerindeki etkileri araştırıldı. Bu doğrultuda, sıralı açıklayıcı karma yöntem bir araştırma deseni tasarlandı ve Türkiye'deki bir vakıf üniversitesinin Pilotaj Eğitimi programına kayıtlı 21 öğrenci pilottan ikinci dilde iletişim kurma istekliliği ve İngilizce konuşma ölçekleri, kelime bilgisi testi, geri okuma performans görevleri ve odak grup görüşmesi aracılığıyla nicel ve nitel veri toplanmıştır. Sonuçlar, katılımcıların bir dönem boyunca on simülasyon oturumunu tamamladıktan sonra ikinci dilde iletişim istekliliklerinin ve geri okuma performanslarının yanı sıra kelime bilgilerinin de önemli ölçüde geliştiğini gösterdi. Ayrıca katılımcıların İngilizce konuşma kaygısı düzeylerinin de önemli ölçüde azaldığı tespit edildi. Nitel sonuçlara bakıldığında ise simülasyon temelli eğitimin öğrenci pilotlar için yenilikçi ve etkili bir yöntem olduğu sonucuna varılmıştır. Ancak teknoloji altyapısı ve ders tasarımı açısından hâlâ geliştirilebilecek noktaların var olduğu tespit edilmiştir. Mevcut çalışma, simülasyon-temelli Havacılık İngilizcesi eğitimi konusunda ortaya koyduğu bilimsel bulgular ve gelecekte bu alanda yapılacak çalışmalara öncülük edecek nitelikte olması nedeniyle ile alanyazında bir ilk olmuş ve alanyazına önemli bir katkı

sağlamıştır. Çalışmanın sonunda, havacılık alanındaki eğitimciler ve diğer paydaşlar için çıkarımların yanı sıra gelecekteki araştırmalar için önerilere yer verilmiştir.

Anahtar Kelimeler: Özel Amaçlı İngilizce Dil Eğitimi, Havacılık İngilizcesi, İkinci dilde iletişim kurma istekliliği, İngilizce konuşma kaygısı, Geri okuma performansı, Kelime öğrenimi, Simülasyon.





To a new beginning in my life with my beloved wife Gülbin and my dear parents

ACKNOWLEDGEMENTS

I wish to convey my appreciation to those individuals who made valuable contributions towards the successful culmination of my dissertation.

Firstly, I would like to convey my appreciation to my supervisor, Prof. Dr. Derin ATAY, for her valuable guidance and insightful feedback on my academic endeavors. She provided invaluable guidance and support in nurturing my vision and enhancing my academic skills throughout the entire process, drawing from her extensive expertise and experience. Her supportive demeanor enhanced my self-assurance and drive, allowing me to meticulously navigate each step of the process.

I would also like to extend my appreciation to Prof. Dr. Yasemin KIRKGÖZ for her excellent input and continuous academic assistance she offered before and during this research process. Also, I wish to convey my appreciation to the members of my committee, namely Assoc. Prof. Enisa MEDE, Asst. Prof. Gürsu AŞIK, and Asst. Prof. Pınar BAŞKAN, for their perceptive critiques and innovative concepts that have expanded my perspective on the topic and influenced the development of my dissertation.

I would like to sincerely thank my friend, Sinan OKUR, PhD., for his important support throughout my doctoral study and during the data analysis process. Also, I am grateful to my friend and ICAO rater, Nazmi DİNÇER PhD.(C), for his contribution as the second rater in the readback performance assessment. Moreover, I would like to express my gratitude to the participants for their significant contribution to my doctoral thesis by openly sharing their own experiences and perspectives.

I express my profound appreciation to my beloved parents and twin-brother. This dissertation would not have been feasible without the comforting companionship and resilience they provided me in my pursuit of my aspiration. I am grateful to them for supporting me even in the most hectic moments during this process.

Lastly, I would like to convey my utmost appreciation to my beloved wife Gülbin. I have always felt her ongoing support and encouragement during the most challenging times for us in different countries.

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LIST OF ABBREVIATIONS

ASRS	Aviation Safety Reporting System
ATCO	Air Traffic Controller
ATPL-A	Airline Transport Pilot License-A
CEFR	Common European Framework of Reference for Languages
CRM	Crew Resource Management
DGCA	Directorate General of Civil Aviation
EFL	English as a Foreign Language
ELF	English as the Lingua Franca
ELT	English Language Teaching
ESL	English as Second Language
ESP	English for Specific Purposes
FL	Foreign Language
FLA	Foreign Language Anxiety
GDSAA	General Directorate of State Airports Authority
GE	General English
GENAI	Generative Artificial Intelligence
ICAO	International Civil Aviation Organization
L2	Second Language
LPRS	Language Proficiency Rating Scale
NASA	National Aeronautics and Space Administration
VLS	Vocabulary Learning Strategies
VR	Virtual Reality

Chapter 1

Introduction

1.1 Overview

The main purpose of this chapter is to set the background of present study. It starts with a review of the subject at hand, then moves on to the problem statement. Then, the purpose of the study and the research questions are provided in the sections that follow. The chapter ends with the significance of the study as well as the definitions of the key terms used in the study.

1.2 Background of the Study

Aviation has a significant impact on our daily lives in our ever evolving and developing environment. With the most recent advancements in engineering and technology, air travel is now a common occurrence in people's daily lives all around the world. This may seem promising towards increased levels of quality of life. The lackluster quality of air accident news, however, is hardly shocking in the twenty-first century. Although people rely highly on air transportation and consider it as one of the safest means of transportation, there is still much to uncover for safer flight operations. According to the International Civil Aviation Organization (ICAO), 2014 was the year with the highest number of fatalities ($n = 911$) and accidents ($n = 130$) in aviation history since records of aviation incidents first started being kept in 1946.

An intriguing issue that needs serious attention regarding the air traffic accidents is that the ever-increasing air traffic worldwide may pose a threat to safety since increased frequency of flights now signals increased involvement of human factors as a contributing factor to the potential air traffic accidents and incidents. As such, we witnessed the highest demand on air transportation in the 21st century, except for the decrease during the Covid-19 pandemic. No matter how badly the air traffic was hurt by Covid-19 between 2020 and 2022, the industry has been recovering noticeably. Compared to the same period in 2021, the number of passengers carried by air climbed

by 65% from January to April 2022, while the number of aircraft departures rose by 30% according to ICAO. Therefore, serious thought should be given to human factors in air operations.

Despite decades of rapid aviation progress, human factors are considered as a significant contributing component in aviation accidents and incidents (Dobson, 2017). An early study conducted by Murphy (1980) to determine the causes of aviation accidents reported that communication, decision making, and crew interaction were the most significant issues related to human factors in the eighty-four commercial aviation accident reports published by the National Aeronautics and Space Administration's (NASA) Aviation Safety Reporting System (ASRS). Later, several scholars investigated another significant human factor, namely misunderstandings, in air traffic accidents (Drury & Ma, 2002; Molesworth & Estival, 2015). Although these studies were influential in terms of highlighting the role of English language proficiency in this ever-growing business, these scholarly attempts were quite late.

Civil aviation authorities took notice of the English language's growing significance in the 1980s. Likewise, air transport companies also started to give serious thought to the development of crew resource management (CRM) since human factors trainings as part of CRM were reported to decrease accidents and the damage to the aircrafts (İnan & Bükeç, 2020). However, it was quite late for authorities to become aware of the significance of English language proficiency, which is also associated with human factors, because this awareness was particularly related to the Tenerife Disaster in 1977. This deadly disaster marked the mention of the direct influence of English language proficiency in an official post-accident report in the aviation history. Eventually, the industry needed to take prompt action to increase safety after realizing the critical role that language proficiency plays in aviation and the severe consequences it can have on pilots. The ICAO introduced a new criterion in 2003 and required all pilots to sit for a language proficiency test. As of 2008, all pilots and air traffic controllers are required to perform at Operational Level or higher. The test takers are assessed under six categories: pronunciation, vocabulary, fluency, comprehension, interactions, and structure, as described in the ICAO Language Proficiency Rating Scale (LPRS). Failure to perform below level four results in the temporary suspension of the pilot license or air traffic controller license.

The aviation industry is challenged by globalization as well. Since there exists no more boundaries amongst countries, native and non-native English-speaking people

now contact with each other more than ever. Similarly, native and non-native English-speaking pilots and ATCOs need to communicate effectively in everyday flight operations. This requires both sides to be equally proficient in English. Otherwise, the industry may fail to establish effective communication even between native English-speaking pilots and ATCOs. As such, the risk to aviation safety caused by native English speakers' non-adherence to ICAO phraseology, frequent use of jargon, slang, non-standard phraseology, and excessive dependence on plain language has already been identified by Moder (2013). Therefore, native English speakers who disregard the regulations run the risk of being just as hazardous as non-native speakers.

Another issue regarding the English language proficiency of pilots is associated with the increased demand on pilots which is in line with the increase in the frequency of air traffic. Although there are increased opportunities to become a pilot these days, the investment required to perform this profession is two-fold. On the one hand, the student pilots and flight schools must invest in instructional tools including theoretical training, simulation software and hardware, and training flights; on the other hand, they must allocate their resources for the development of English language proficiency. However, these trainings are both costly and time-consuming. Thus, it can be hereby argued that student pilots' ride on the road to the cockpit is quite bumpy since becoming a pilot requires a great deal of material and spiritual investment.

The regulations in effect have had significant influence on Türkiye, a rising competitor in the global aviation business. Turkish aviation has changed over time, much like the rest of the world. Turkish aviation currently plays a significant role in serving the requirements of the country's citizens and enterprises. Since 1933, some new initiatives have been implemented to keep up with the times. For instance, the General Directorate of State Airports Authority (GDSAA) was established in 1933, followed by the Directorate General of Civil Aviation (DGCA) in 1987, Türkiye joining the Chicago Convention in 1944, and finally taking part in the establishment of ICAO in 1947. However, student pilots in Türkiye, as English as Second Language (ESL) learners, are suffering from the lack of hands-on experience to use English in the target setting (Demirdöken, 2022). Consequently, the development of English language proficiency towards meeting the language proficiency requirements of ICAO is a significant issue. Considering the afore-mentioned challenges, student pilots around the world definitely need to strive hard to save a seat in the cockpit. That is why, the contribution of research into English for Specific Purposes (ESP) teaching in

general, Aviation English in particular, is of utmost importance for safer flight operations.

1.3 Problem Statement

Aviation English standard phraseology is a specific register of English rather than a conversational style; it is a regulated, shortened, jargon-filled language that uses numbers and descriptors to quickly communicate important information. The exchange of information is made by means of radiotelephony. That is, interlocutors on both end of the radio signal, namely pilots and air traffic controllers, share the same radio frequency and they are exposed to radio static frequently. Aviation English messages must be delivered clearly and emotionlessly amidst several other duties to be completed in the cockpit and in the air traffic control tower. Aviation experts from all around the world use this particular register of English as the lingua franca. In addition to the challenging nature of radiotelephony communication, pilots are also expected to be aware of other traffic around them. In this sense, they need to develop high levels of situational awareness, and the inability to attain it may lead to accidents (Borkowska, 2018). Besides, the high cognitive load of flying consumes cognitive resources that may be used to process and respond to verbal input (Trippe & Baese-Berk, 2019). Therefore, the burden on native and non-native English-speaking pilots need to be eased.

Without a doubt, ESP is a subject that researchers are quite interested in. The research into ESP teaching in Türkiye has so far focused on a variety of learner groups including police officers (Ulum, 2016), gendarmerie officers (Solak, 2012), and architecture students (Ulum, 2020). These studies have all shed light on their particular ESP contexts and made significant contributions to the literature. However, little is known about Aviation English context, and prior research lacks sound findings that may address the linguistic challenges faced by non-native English-speaking pilots in Türkiye. The limited knowledge we have in Turkish context is thanks to a number of recent efforts that reported the need analysis of Aviation English learners (Demirdöken, 2022), challenges of Aviation English teachers (Demirdöken, 2021), speaking anxiety of Aviation English learners (Demirdöken & Okur, 2023), motivation and achievement of Aviation English learners (Demirdöken & Atay, 2022), use of instructional technology tools (Dinçer & Dinçer, 2022), flight attendants (Alkur,

2019; Kaya, 2021; Sönmez Boran, Çiloğlu, & Durmaz, 2020). However, no empirical study has reported on how to develop English language proficiency of student pilots in Türkiye by means of simulation. In this sense, the present study is a significant step to address the challenges student pilots who aim to develop their English language proficiency.

1.4 Purpose of the Study

The main purpose of the present study is to design a simulation-based Aviation English course for the development of English language proficiency of student pilots in Türkiye. In addition, this research is multilayered in the sense that it aims to highlight a number of variables in relation to simulation-based training. Accordingly, English speaking anxiety, willingness to communicate in English, and vocabulary development as well as the readback performance of student pilots during the simulation-based training will be analyzed. Besides, the perceptions of student pilots about simulation-based training will be explored in the present study.

1.5 Research Questions

The need to generate solutions to the linguistic challenges faced by student pilots in Türkiye paved the way for the present research study. Accordingly, the following research questions were addressed in this study:

RQ1: How will simulation-based training influence English language development of student pilots in Türkiye?

RQ1a: How will simulation-based training influence the English-speaking anxiety of student pilots in Türkiye?

RQ1b: How will simulation-based training influence student pilots' willingness to communicate in L2?

RQ1c: How will simulation-based training influence the vocabulary development of student pilots in Türkiye?

RQ1d: How will simulation-based training influence the readback performance of student pilots in Türkiye?

RQ2: What are the perceptions of student pilots in Türkiye toward simulation-based Aviation English training?

1.6 Significance of the Study

The present study is distinctive and significant for several reasons. Primarily a simulation-based program has been, for the first time, designed in the Aviation English context, and its influence on student pilots' English language proficiency development has been explored in this context. Previous research only focused on the simulation-based training in the GE contexts. Therefore, the present study is a pioneering work in the field of ESP. Second, L2 speaking anxiety and willingness to communicate in L2 have not been explored in simulation-based training settings and in relation to proficiency in Aviation English, so the present study is the first work in the literature that reports on these variables in a simulation-based Aviation English training setting, which makes it another distinctive feature. Considering these significant contributions of the present study, ESP practitioners can now develop a better understanding of these variables affecting the English language proficiency of student pilots, which may have fatal consequences if these learners cannot attain proficiency in Aviation English. The findings reported in this study will, therefore, facilitate ESP practitioners toward developing more effective Aviation English curricula.

Also, no solution has been offered to develop the readback performance of pilots despite several attempts to identify the reasons for the communication problems between pilots and ATCOs (Molesworth & Estival, 2015; Trippe & Baese-Berk, 2019; Wu, Molesworth, & Estival, 2019). Since readback performance has been identified as a significant challenge impeding effective communication in the air and on the ground, particularly during take-off and landing, it is, therefore, of utmost importance that stakeholders take prompt action to improve the quality of air-to-ground and ground-to-air communication. Accordingly, this study has made a significant contribution to the research into Aviation English by exploring the potential of simulation-based training in improving the readback performance of student pilots.

Additionally, vocabulary development is a challenging component of second language learning. It is relatively more challenging when individuals strive to attain proficiency in a particular field like aviation. In contexts like Türkiye, where English is not the common means of communication, English language learners have difficulty in developing a solid foundation of vocabulary. That is why, English language teachers instrument different tools in the classroom to facilitate learners toward developing an extensive vocabulary. These include augmented reality (Zhang, Wang, & Wu, 2020),

mobile games (Chen, Liu, & Huang, 2019), storybooks (Wang, 2022), and gamification (Panmei & Waluyo, 2022), etc. However, the possible influence of simulation on the vocabulary development of English learners is yet to be explored. Therefore, the present study will be the first research into this uncharted field of study in aviation context.

Finally, integrating simulation training into English language learning environments has started to attract the attention of researchers recently. These contributions have typically investigated the development of general English language proficiency of L2 learners (Chang, Chen, & Liao, 2020; Wang, 2019; Zhang, 2020). However, this study has extended prior research into simulation-based training for English language teaching by exploring the influence of simulation-based training in the aviation context and the perceptions of student pilots on it. Taking these unique features of the present study into account, it can be argued that it will significantly enhance our understanding of simulation-based training in the aviation context.

1.7 Definitions

Crew resource management (CRM): “The true definition of CRM is its focus on the proper response to threats to safety and the proper management of crew error.” (Kanki & Helmreich, 2010, p. 61)

English as a foreign language (EFL): The term refers to teaching “English is a foreign language for learners in whose community English is not the language of communication.” (Thornbury, 2006)

English as lingua franca (ELF): The term refers to English language being “a vehicular language spoken by people who do not share a native language.” (Mauranen, 2003, p. 513)

English as second language (ESL): The term refers to the “exposure to target language in its natural setting.” (Stern, 1983)

English for specific purposes (ESP): The term refers to “English in a language course or program of instruction in which the content and aims of the course are fixed by the specific needs of a particular group of learners.” (Richards & Schmidt, 2002)

Simulation: The term refers to the “educational tool or device with which the learner physically interacts to mimic real life.” (Cook, Brydges, Zendejas, Hamstra, & Hatala, 2013, p. 876)

Chapter 2

Literature Review

This chapter presents an overview of the literature that relates to the work presented in this research. First, English for Specific Purposes as the umbrella term is briefly reviewed to set the background. After the initial overview of this term, the chapter focuses on Aviation English, which is a field of research classified under ESP. The chapter also provides a detailed review of the existing literature regarding Aviation English. Third, the present chapter reviews the integration of simulation into ESP, ab-initio pilots' readback performance, English speaking anxiety, and willingness to communicate in L2, respectively.

2.1 English for Specific Purposes

English for Specific Purposes (ESP) has been a unique activity within the area of English Language Teaching (ELT) since the 1960s and it is classified under English as a Foreign Language (EFL) (Hutchinson & Waters, 1987). While the latter refers to the study of English by those whose first language is not English, ESP can be defined as the study of English by those whose first language is not English but who require it for a specific task, activity, or goal. Therefore, it consists of several different aspects as well as a deep-rooted history. Accordingly, this section first provides the history of ESP and then, it discusses the definition of ESP as well as its features.

2.1.1 History of ESP. English for Specific Purposes (ESP) has a lengthy history and is currently the focus of numerous studies. Scholars' interest has been drawn to ESP since its initial development in the 1960s and continues today. When a General English (GE) course was judged to be insufficient to fulfill the needs of learners, ESP was first implemented. ESP first manifested itself as a result of a number of world-wide changes, including the demands of the new world order, changes in the demand for foreign language proficiency, and the shift to learner-centered education.

One could say that the history of ESP has two climaxes. The first climax occurred in 1945 at the conclusion of World War II, which cleared the way for a period of great advancements in science, technology, and the economy, which were

undoubtedly the outcomes of factors like the ascension of the United States as the new superpower. As a result, English came to be known as the lingua franca. The second turning point was the oil crisis in the early 1970s, which prompted Western finance and knowledge to move into oil-rich regions (Ulum, 2016). The importance of the English language on global commerce is thought to have caused people to prioritize learning English over other foreign languages at that point. Additionally, it may be claimed that ESP education began in the 1950s and 1960s, but it really took off in the 1970s (Dudley-Evans & St John, 1998). Since English started to play a crucial role as the lingua franca, it produced modern learners who were aware of the importance of learning a foreign language. Considering such deep-rooted history of ESP, it becomes difficult to make clear distinctions among different phases of ESP research. This leads us to the classification of ESP history under four main eras: “The Early Years (1962 – 1981), The Recent Past (1981 – 1990), The Modern Era (1990 – 2011), and The Future (2011 plus)” (Johns, 2012, p. 7).

The first era in the history of ESP, namely *The Early Years*, starts with the decades that immediately post World War II. English for science and technology (EST) in academic contexts was at the time the main emphasis of ESP research, and this interest still exists today. The study conducted during the first years of this time period is argued to be descriptive and involved statistical counts of grammar usage in written discourses. The second era was called *The Recent Past* by Johns (2012), which marked the widening of the ESP research and the emergence of the English for Specific Purposes Journal. Needs assessment, linguistic devices and their rhetorical purposes, error analysis, genre and rhetorical moves were covered with the expansion of its scope. *The Modern Age*, which was the third era in ESP history, was by far the most significant era since articles about text analysis, academic argumentation, and other topics that relate to ESP interests started to surface more frequently. However, Johns (2012) argues that the reason for ESP gaining so much importance between 1990 and 2011 is that “academics are now required to publish in international journals (preferably those on the Social Science Citation Index) in order to be promoted in their home institutions” (Johns, 2012, p. 13). Finally, the fourth and last era included the years following 2011 and it was named *The Future*. With the most recent advancements in technology and the increase in the demand on “more knowledgeable” individuals in terms of technology literacy and 21st century skills, ESP has expanded to various fields and thus it now embraces scholars from numerous research areas.

Consequently, it is expected that ESP research will welcome various research topics, methodologies, and contexts in the near future.

2.1.2 Definition of ESP. English for Specific Purposes (ESP), in general, is used to describe the teaching and learning of English as a second or foreign language where the learners' aim is to utilize English in a specific domain. However, arriving at a solid definition of ESP requires a good understanding of aspects that make up this term.

Primarily, the enormous expansion in science, technology, and economy in the post-WWII era generated a demand for a lingua franca. Due to the economic and political power of English-speaking countries in that era, English language became the lingua franca. Therefore, proficiency in English started to be regarded as a sign of well-rounded education. This created a demand on teaching English to people who have specific purposes for learning English.

Second, the practitioners in the field of ESP needed to revise the existing curricula at that time as well as design new ESP courses. The main reason for such change had its roots in the way English started to be used as the lingua franca for communication purposes around the world. Until then the conventional approach to English language teaching had focused on the rules of the language, that's grammar. However, this approach was gradually replaced by the view that prioritized the functional and communicative use of the language in different contexts and for different purposes. This paved the way for English language being regarded as context specific.

Finally, the field of ESP went through a revolution in terms of the way learners were regarded, which significantly shaped the way it is defined today. The traditional approach placing teachers at the heart of the instruction gradually shifted towards a more meaningful approach emphasizing the learners' motivation, needs, and expectations. The main cause of such revolution was related to the contribution of researchers conducting studies in educational psychology. Consequently, the practitioners in the field of ESP started to develop unique materials or to adapt the existing materials based on the particular needs and studies of the target learner group. Thus, the specialization in language learning came into prominence, and the learner-centered approach dominated the field.

Considering the revolution of ESP, it is not surprising that many attempts have been made to define ESP as a term. Each attempt, however, managed to highlight a

particular aspect of what we regard as ESP today. For instance, ESP is described as "an approach to language education in which all decisions as to content and manner are based on learners' reasons for learning" by Hutchinson and Waters (1987, p. 19). In light of this, they recommended that the language education programs be tailored to the particular rationales of students. ESP was, on the other hand, defined as a "goal-directed" language education program by Robinson (1991, p. 3). Thus, the target learning outcomes and necessities regarding the target work context were highlighted. The role of English in a language course or program of instruction in which the objectives and content of the course are dictated by the unique needs of a specific group of learners was what Richards and Schmidt (2002) characterized in their definition of ESP. In the light of previous attempts to define ESP an all-inclusive, solid, and workable description of ESP can be hereby argued to include the following must-have principles: goal-directedness, learner-centeredness, and context specificity.

2.1.3 Features of ESP. Having provided the core principles of the definition of ESP, it is now time to review the features of it since any review of ESP excluding its unique features would be inconclusive. As mentioned in the previous section, ESP has become a more distinct discipline since the 1960s. Generally speaking, this unique field of teaching is specialized English rather than General English (GE). As such, teaching strategies and the learning environment are distinct from those utilized in General English. Besides, the learners and their goals for learning English are significant distinctions between ESP and GE. The former also differs from the latter as a distinct area of education in that GE places equal emphasis on reading, writing, listening, and speaking. However, ESP courses may focus on one or more particular language skills. That is, any ESP course must be designed in line with its target learners' needs in order for those learners to benefit from it and make progress towards meeting the professional requirements of their particular profession.

In particular, the learners are one of the most important distinctions between ESP and GE. While GE students come from a variety of age groups, ESP students are often adults who are already familiar with the English language and are learning it to become more proficient speakers of the target language in order to perform better in the target work setting. Besides, GE students usually study English as required coursework or for personal pleasure whereas ESP students are motivated primarily by professional

needs. Additionally, ESP courses are designed to familiarize learners with the target context as opposed to the grammar-based instruction, which can be typical in GE.

Another distinction can be made in relation to the background of learners and the language use. ESP learners are often people with some prior knowledge of English who are learning the language to express a specific set of professional skills and to carry out certain profession-related tasks. Therefore, an ESP course is created based on an evaluation of goals, objectives, and the tasks for which English is required. In contrast to teaching grammar and linguistic structures, ESP places more emphasis on language in context and includes a wide range of topics, including tourism and hospitality management and business or medical sciences.

General English and ESP also differ from one another in terms of different learning objectives. The key element of ESP is that English is blended into a subject matter area that is significant to the learners' goals rather than being taught as a subject isolated from their real world. Therefore, the syllabus for any ESP course is created in accordance with the needs analysis that identifies the language skills that the learners most urgently want. For instance, an ESP program would place a strong emphasis on speaking proficiency improvement for students preparing to become a pilot. Students learning English to become aircraft maintenance technician may, on the other hand, benefit from an ESP that prioritizes the reading skill since that position requires proficiency in understanding aircraft user and maintenance manuals.

Lastly, it is of great importance that ESP practitioners distinguish between two things: variable and absolute characteristics of ESP. Put forward by Dudley-Evans and St John (1998, pp. 4-5), the three absolute characteristics of ESP are as follows: (1) ESP is designed to meet specific needs of the learner, (2) ESP makes use of the underlying methodology and activities of the disciplines it serves, and (3) ESP is centered on the language (grammar, lexis, register), skills, discourse, and genres appropriate to those activities whereas the four variable characteristics of ESP are as follows: (1) ESP may be related to or designed for specific disciplines, (2) ESP may use, in specific teaching situations, a different methodology from that of General English, and (3) ESP is likely to be designed for adult learners; either at a tertiary level institution or in a professional work situation. It could, however, be used for learners at secondary school level and so, (4) ESP is generally designed for intermediate or advanced students. Most ESP courses assume basic knowledge of the language system, but it can be used with beginners.

To put it briefly, ESP differs from GE in terms of learners, learning objectives, and target language skills. Furthermore, the afore-mentioned distinct features of ESP make it a unique field in English language teaching and thus, developing a good understanding of its features becomes more of an issue for its practitioners so that effective ESP courses can be designed and developed.

2.2 Aviation English

Aviation is quickly assuming a significant role in people's lives, and Aviation English is now acknowledged as an essential part of the aviation business. Additionally, it is defined as a subset of ESP that has a clear and specific focus on aviation, including phraseology and straightforward language. According to Aiguo (2007), it includes the plain language used for radiotelephony communications when other phrasing is insufficient. However, it is not limited to communications between controllers and pilots; it can also refer to any other use of English in the aviation industry or among maintenance technicians, flight attendants, dispatchers, managers, and officials. In this sense, Aviation English can occasionally call for the use of general English and contains, but must not be limited to, International Civil Aviation Organization (ICAO) phraseology. That is,

“...on the one hand, it means the correct and standard use of terminologies or phraseologies in air/ground communication, aircraft manufacturing and its specification, even legal terms in aviation law; on the other hand, it refers to the general use of the English language among aviation staff in daily communication, regardless of its nationality, race, and different cultural backgrounds” (Aiguo, 2008, p. 154).

This necessitates twofold ESP research and training. While analyzing the possible influences of compliance or non-compliance with the standard phraseology on communication breakdowns, if and how deterioration in the use of plain language in non-routine situations may affect aviation safety should also be studied since the aviation history suffered from the latter as much as the former.

The Tenerife accident in 1977 claiming 583 lives, the mid-air collision over Charkhi Dadri, India in 1996, and the fatal crash that resulted from a flight crew's failure to alert air traffic controllers to a critical fuel level and killed 73 people all occurred in the past four or five decades. Accordingly, communication, or lack thereof, was reported as a contributing factor in several accident investigations. Besides, a recent incident in December 2018 set an example to this concern. This incident took place in the USA due to the inability of a student pilot to establish effective communication with the instructor pilot during takeoff. According to the instructor pilot who reported the incident, the student pilot was directed to pull on the yoke when told to do so, but the instructor did not specify how hard to pull, which led to damage to the aircraft's tail. The student pilot should have made sure that the instructor pilot's instructions were understood because the instructor pilot's instructions were not clear. In truth, this circumstance required both English-speaking parties to seek for clarification, however neither the student pilot nor the instructor pilot complied with ICAO language requirements. This demonstrated that even the native English-speaking pilots may suffer from miscommunication and that there is no margin for error in aviation regardless of their linguistic background.

Another instance of communication breakdown was at the John F. Kennedy airport in the USA in March 2019. The air traffic controller and the pilot of a jet-powered passenger aircraft were unable to communicate with one another. The air traffic controller was attempting to speak with the pilots and give the take-off clearance when the controller unexpectedly realized that the aircraft on the departure roll was actually another aircraft with a similar sounding callsign. The targeted flight's pilots, however, were unable to distinguish between the sound of their own callsign and that of the other flight. In the end, this circumstance led to the coordination of the incorrect flight, which could have even resulted in a mid-air crash. Based on the reporting considering the incident, it can be concluded that two similar aircraft callsigns caused the problem. This incident highlights the challenging nature of air traffic control and communication even in those air spaces where English is the first language of aviation professionals.

English is the lingua franca not only in the aviation industry but also in many other businesses. Besides, the number of non-native English-speaking professionals in the worlds is by far more than native English-speaking professionals. This is partially related to the developments after the post WWII era, as discussed in previous sections,

and partially to the globalization of the world which led to the removal of boundaries and more frequent contact between native and non-native English-speaking people for different purposes. In the context of aviation, this meant an increase in the number of the employment of non-native English-speaking pilots to meet the demand on air travel and hence, the inclusion of these pilots in overseas flight operations. Consequently, the communication among native and non-native English-speaking pilots as well as air traffic controllers became more prone to communication breakdowns as highlighted above.

The increase in the threat posed by miscommunication also led to a growth in interest in the research into Aviation English. The efforts made in this field until the 21st century were pioneering yet limited (Girginer, 1998; Proctor, 1996; Ragan, 1997). However, the research into Aviation English in the last two decades significantly varied and researchers started to specialize in different fields of Aviation English. One of the key research areas was inevitably the communication errors, and the findings of these studies varied in terms their influence on pilots' performance (Hamzah, 2021; Ishihara & Prado, 2021; Thorpe et al., 2022). For instance, the study conducted by Thorpe et al., (2022) aimed to find out if pilots can effectively prioritize their attention and avoid letting recognized communication-impacting circumstances interfere with their ability to fly. The researchers concluded that pilots could prioritize their tasks well and, more crucially, that characteristics known to impair communication, such as increased ATC speech rate, information density, and workload, did not prevent them from putting flying first. However, Molesworth and Estival (2015) had reported that needing four or more elements in a single radio transmission reduced the effectiveness of communication, which was also clear when pilots were overloaded by the workload. Although the research findings in these studies conflicted with each other, they both highlighted that pilots' flying performance and thus their communication may be negatively influenced by workload, yet maintaining safe flight operations is still possible if pilots are professionally trained on how to prioritize their attention and manage verbal tasks.

The constant need for effective communication in aviation requires a solid foundation of vocabulary. An industry-specific language that defines and communicates professional expertise is used in aviation English, which is used for professional communication. Therefore, Aviation English vocabulary acquisition appeared as another area of research for several researchers (Dinçer & Dinçer, 2021;

Fainman & Tokar, 2021; Fursenko et al., 2021) who mainly sought to enhance ab-initio pilots' vocabulary acquisition. Accordingly, various methods have been proposed for effective vocabulary acquisition. For instance, Dinçer & Dinçer (2021) investigated the influence of a serious simulation game called X-Plane 11. They found out that serious gaming improved the attainment of learning outcomes. The medium effect size in the experimental group was reported to significantly increase after the incorporation of the serious game. This finding was also observed in participants' reflections highlighting that the serious game was helpful and inspiring for language learning despite the minority difficulties brought on by the level of language, hardware, and software kinds. In another attempt, Fainman and Tokar (2021) aimed to explore how authentic videos influenced the vocabulary acquisition in the aviation context. The results demonstrated that on the post-test, the students who had seen real films fared statistically better than the control group. These findings were largely consistent with the state of the art in the field, and they drew the conclusion that ESP instructors needed to employ real video content to improve vocabulary learning. Finally, Fursenko et al. (2021) decided to integrate Quizlet into an Aviation English course in Ukraine and test the effectiveness of using the Quizlet computer-based flashcard tool to educate future air traffic controllers job-related terminology. According to their empirical data, Quizlet was found to be a useful vocabulary learning tool that had a beneficial impact on students' speaking ability and interest in learning aviation English. They also concluded that speaking practice and accidental vocabulary acquisition methods needed to be included to aviation English courses' purposeful vocabulary learning component implying explicit vocabulary teaching.

ESP researchers also showed a growing interest in ESP teachers. One such attempt was made by Meristo and López Arias (2020). They conducted research in the Estonian ESP setting and concluded that “coping with changes through the lenses of professionalism, insufficient collaboration, and instability in conducting ESP courses” were three major challenges faced by Estonian ESP teachers. Although it offered insights into ESP teachers' challenges, it did not shed light on those who offer AE courses. In a more fruitful attempt, Kırkgöz (2019) explored the needs of Turkish pre-service ESP teachers by designing a teacher education program with a constructivist perspective. She concluded that the constructivist approach could be successfully integrated into teacher education programs for improved learning gains among pre-service teachers in Türkiye. A significant step towards identifying the challenges of

Aviation English teachers was made by Demirdöken (2021) who argued that ESP teachers in Türkiye had low degree of self-efficacy and contextual knowledge. While these issues were identified as the most significant challenges of these teachers, lack of professional development programs and inexperience in Aviation English teaching were reported as the underlying reasons for those issues.

Another significant research interest that has emerged recently is the Aviation English learner differences. A recent study conducted in the Ukrainian context explored the underlying factors of motivation to learn Aviation English (Moskalenko et al., 2019). Their findings showed that debates, dialogues, interactive exercises, and role plays boosted student pilots' motivation to learn aviation English. On the other hand, having a lot of homework, worrying about marks, and viewing a teacher as an authoritative figure all had a detrimental impact on how motivated student pilots were to learn Aviation English. In a similar vein, the proficiency and performance of Iranian air traffic controllers (ATCOs) were investigated (Rahmati & Izadpanah, 2021). The findings showed that passing aviation English courses positively moderated the influence of Iranian ATCOs' performance on their proficiency. However, the same variable was found to negatively moderate the effect of their attitude on their proficiency.

Finally, two studies conducted in Turkish context offered insights into Aviation English learner differences (Demirdöken & Atay, 2022; Demirdöken & Okur, 2023). The former study provided important findings regarding the the relationship between L2 motivation and L2 achievement. The researchers found out that L2 achievement of aviation students was predicted by ideal L2 self and ought-to L2 self, whereas achievement motivation did not account for L2 achievement for the same cohort of participants. The latter study, on the other hand, aimed to analyze the mediating role of English learning motivation and self-confidence on the relationship between English-speaking anxiety and English self-efficacy. The results showed that English learning motivation and self-confidence played multiple mediating roles in the relationship between English self-efficacy and English-speaking anxiety.

The aforementioned studies have all showed that Aviation English is made up of various components that need to be carefully analyzed. Considering the ramose nature of Aviation English, it becomes crucial to take as many variables of Aviation English into account as possible when designing a research study for the purpose of

improving Aviation English teaching. Accordingly, the following subheadings will discuss the existing literature into the speaking and listening skills in Aviation English.

2.2.1 Speaking skill in aviation. Proficiency in English speaking is vital in the aviation business since it is necessary for guaranteeing the safety through clear and effective communication. ESP is, therefore, tailored to meet the specific needs of individuals or groups in this industry. This type of English language instruction is usually designed for non-native speakers who need to use English in a particular profession, field of study, or workplace. Likewise, ESP courses focus on language skills that are relevant to the learner's specific context and needs. Improving speaking skills is one of the main goals of ESP, as effective communication is essential in most professional settings. In this sense, ESP courses are designed to provide learners with opportunities to practice speaking, develop fluency, and increase their confidence in using English in real-life situations.

International Civil Aviation Organization (ICAO) establishes rules that all of the member states must abide by. In this regard, the use of English language in all airspaces is mandated by ICAO. What is more, ICAO requires all pilots and air traffic controllers to perform at a certain level of English as described in ICAO Language Proficiency Requirements which include six areas of language proficiency, and speaking skill is one of them. As of 2011, all member states have been required to adhere to rules governing language testing to determine the English language ability of pilots and controllers. The English competency scale suggested by ICAO works reasonably well to evaluate pilots' use of common phrases, especially in everyday contexts. For instance, when controllers provide permission for an aircraft to take off or land, they use preset language like "cleared for take-off" or "cleared to land." No additional words or variations are permitted. However, in atypical circumstances, pilots and controllers will employ plain AE to respond to requests for ease and safety. Additionally, non-routine scenarios where urgent or sophisticated requests from interactants must be met by plain language due to technical issues or even emergencies exist in pilots' and air traffic controllers' workplaces. Consequently, proficiency in speaking skill appears as a crucial issue in this context.

Another issue regarding the speaking skill in the aviation context can be associated with the nature of radio communication. This type of communication and its dependability and resilience have been studied by applied linguistics. In a study by

Estival and Molesworth (2009) it was argued that "communication problems within General Aviation cannot be solely attributed to language proficiency levels of EL2 pilots." It can be hereby argued that these findings mark communication issues as a problem affecting all pilots. Therefore, ensuring safer flight operations is only possible if both native and non-native English-speaking pilots and air traffic controllers raise a linguistic awareness towards enhancing comprehension and clarity in the air and on the ground since they share and use the same airspace every day. In addition, the study conducted by Kim (2012) explored the concept of English from the afore-mentioned perspective by means of questionnaires and interviews with Korean international airline pilots and air traffic controllers. She requested participants to remark in focus groups on radiotelephony conversations between pilots and air traffic controllers that were captured amid unusual circumstances at a Korean international airport. The findings revealed that communication was hampered by pilots who did not follow conventions, particularly those who speak English as their native tongue and thus, she emphasized the importance of both native and non-native English speakers using appropriate accommodation measures to enable clear and effective communication. Likewise, Kim and Elder (2009) concur, proposing that all pilots—native or non-native English speakers—should receive training in communication techniques appropriate to English as a lingua franca, particularly those of speech simplification and avoidance of redundant information, paraphrasing of utterances.

In brief, the systematic review of literature shows that communication, and hence speaking skill, is of utmost importance in aviation. It can also be inferred that ELF, rather than native speaker norms, should be welcomed and embraced tightly since it is the incorporative component for speakers of Aviation English with different linguistic backgrounds. This can be argued as a workable solution to the issue of miscommunication. Last but not the least, it should be noted that any attempt to design an ESP course for the purpose of improving English speaking skills of ab-initio pilots and air traffic controllers should, therefore, address both standard phraseology and plain language equally.

2.2.2 Listening skill in aviation. The proficiency in English listening skill is important in the aviation industry since clear and effective communication plays a crucial role in ensuring the safety of both pilots and passengers. Pilots and air traffic controllers must develop proficiency in listening skill to be able to understand and

respond to English radio communications in real-life situations, such as weather reports, flight plans, and emergency procedures. The language proficiency requirements set by the International Civil Aviation Organization (ICAO) include clear pronunciation, intelligibility, and the ability to comprehend spoken messages. Those who sit for the English proficiency tests conducted by the ICAO member states have to prove that their comprehension is largely accurate on themes that are frequent, concrete, and work-related and the accent or variety utilized is understandable to a large international audience.

The failure to attain the desired level of proficiency in English listening skill can have a detrimental effect on air traffic safety and can increase the risk of air traffic accidents. If a pilot or air traffic controller has poor English listening skills, they may misunderstand important information, leading to miscommunication and potential errors. This could result in misinterpretation of instructions, incorrect execution of procedures, and miscommunication during critical moments, all of which can contribute to air traffic accidents. As such, the deadliest air traffic accident ever recorded in aviation history was officially reported to have its roots in miscommunication between pilots and air traffic controllers. More than 500 souls had passed away in the so-called Tenerife Disaster in 1977, which later led to the implementation of numerous language proficiency regulations mentioned in the previous sections.

Listening skill in ESP has been studied in relation to and compared with ESL. Fulcher (1999), for instance, argued that EAP testing within the larger context of ESP had a concentration on subject knowledge that had distracted from the basic goal of using test results to draw legitimate conclusions about language knowledge, skills, or talents. He reasoned that this situation had developed as a result of the EAP's perceived requirement to be authentic by including pertinent content from real life. The belief that learners who need ESP training already have some level of competency in the language that allows them to converse in English is one reason for the observed disparities between ESP and ESL listening. Accordingly, McDonough (2010) concluded that learning materials for ESP learners typically concentrate on helping students build the specialized vocabulary of their field of study or employment. Pilots, air traffic controllers, and ground staff, for instance, are expected to utilize and identify slang terms unique to their line of work in order to effectively communicate with English speakers from other nations. Therefore, it can be inferred that specificity of

subject/domain information is helpful for ESP listening, yet learners' overall ESP listening performance would be more impacted by their general ability to listen in the target language.

In the context of aviation, pilots and air traffic controllers rely a lot on active listening. Pilots, for instance, engage in interactive listening when communicating with other professionals about the flight plan, weather report, flight preparations, aircraft maintenance, other traffics, failures, operational restrictions, last minute changes, etc. They also find themselves in one-way listening situations at times when they merely listen to a particular radio station to establish and maintain awareness of other traffic and ongoing procedures in the controlled air space. Considering the fact that these instances of active listening are not restricted to but coupled with maintaining the control of the aircraft, pilots are cognitively overloaded since both tasks are cognitively demanding.

Ishihara and Prado (2021), for instance, explored the pragmatics of Aviation English with a focus on complex discursive construction of meaning. They highlighted the way radiotelephony communication in aviation differed from EFL domains in that the discourse was determined to have an extremely high degree of precision, necessitating urgent rectification as well as proactive measures to avoid possible communication problems, as demonstrated by the institutionalized usage of readbacks. They further reported that misunderstandings in the aviation contexts must be swiftly cleared up in the interest of the joint venture since it involves serious risks to human life and safety. They proposed in the end that more research-informed instruction is required for aviation professionals. Consequently, due to the nature of communication in aviation, it can be hereby argued that ESP Aviation English teaching should seriously consider and include training on development of listening skill for safety on the ground and in the air, and there is still much to be explored with regard to English listening skill in ESP contexts.

2.2.3 L2 vocabulary development in aviation. Foreign language learning is a long and challenging process, and it is influenced by various individual differences as well as some external factors. The variations in the learners and the learning environment itself significantly affect the attainment of desired language skills and proficiency. Depending on the needs and expectations of learners or the language proficiency requirements in the target setting, several different courses are designed.

The learning outcomes in these courses may cover all four language skills or only some of them particular to the nature of the target setting in which the language will be used. Apart from the four language skills, the learners need a solid vocabulary foundation to become proficient users in that particular foreign language. In addition, the size of one's vocabulary plays a significant role in language competence (Alderson, 2005), and learning a foreign language for academic, professional, or general purposes is seen as prioritizing vocabulary acquisition. Thus, effective education geared toward lexical expansion is required.

The ESP students seek to learn English in order to fulfill a specific job, such as that of a flight attendant, mechanic, or doctor, as opposed to the students who learn English for general objectives (Richards, 2001). Accordingly, the ESP courses are designed in line with the requirements of the particular job for which the proficiency in English is required. In the case of aviation English, the learners are either student pilots or ab initio trainee controllers who are required to attain a certain level of proficiency in English based on ICAO language proficiency requirements. They are also obliged to sit for an English language proficiency test in which the test-takers' English language proficiency and performance in English are assessed based on the ICAO Language Proficiency Rating Scale.

This scale includes six assessment categories including vocabulary knowledge which is rated between 1-6, and the test takers must show proficiency at level 4 or higher to be eligible to perform their job. While the lowest score on this category indicates that the test taker "performs at a level below the Elementary level," the highest score indicates that the "vocabulary range and accuracy are sufficient to communicate effectively on a wide variety of familiar and unfamiliar topics. Vocabulary is idiomatic, nuanced, and sensitive to register" (ICAO, 2010). Taking the significant role of and the need for context-specific vocabulary knowledge into account, vocabulary learning appears as a significant matter in ESP settings.

ESP vocabulary is crucial for a number of reasons. Coxhead (2012) argues that understanding and employing the terminology for certain reasons demonstrates the learners' membership in a particular group. Therefore, learners need to use that language to demonstrate understanding, create meaning, and interact with discipline information. If students are to integrate fully into a particular community, then this issue becomes very crucial. Another reason stated by Coxhead (2012) is the need to know that a certain amount of class time is allocated for vocabulary learning. This is

particularly important for the effective design of ESP course materials as well as the time to be allocated for vocabulary teaching in the classroom.

The third issue is related to the size of vocabulary according to Coxhead (2012). That is, in order to completely improve their comprehension and usage of specialist terminology in their subject area at university or in a professional context, ESP learners may confront an extraordinarily significant learning demand. The significance of ESP vocabulary learning is also highlighted by Xhaferi (2010) who argued that words are not learned instantly when learning a new vocabulary; rather, they are absorbed gradually over time. This is because vocabulary acquisition is incremental in nature. He also stated that the quantity of words learned depends on how often a given word is encountered. Building on his statement, it can be hereby argued that communication in an L2 simply cannot take place in any meaningful way without words to represent a wider range of meanings. Since vocabulary learning is crucial in ESP teaching, several studies have explored its role in various ESP settings and several teaching methods have been suggested by researchers.

The methods and strategies for ESP vocabulary teaching have varied in the literature. This variation has mostly been related to the particular needs and learning goals of the learners. In the Spanish context, for instance, Pérez-Sabater and Montero-Fleta (2015) investigated the role of social networking in the vocabulary learning of 75 students enrolled in the English for Architecture course. While the control group received traditional vocabulary instruction on paper, the study group used a social networking site for vocabulary learning. The findings of this study showed that although the new words were used appropriately, with only a few minor spelling mistakes, Twitter, as a social networking platform, did not conclusively demonstrate the advantages for ESP vocabulary learning. Overall, the researchers concluded that the instrumentation of social networking site as an instructional tool made it easier for English for Architecture learners to begin utilizing specialized terminology in the target language in a supportive and informal setting.

Another contribution to ESP vocabulary learning was made by Madini and Alshaikhi (2017) who conducted research in the Saudi context for the purpose of investigating whether Saudi female ESP postgraduate students enrolled in the Didactic Terminologies in English Course could recall terminology specific to their area with the aid of virtual reality (VR) headsets. The students engaged with virtual items for six weeks while watching 360-degree movies about counseling fundamentals and some

cases that called for referrals and consultation. The findings showed that virtual reality movies did in fact aid in the postgraduate students' retention of ESP vocabulary and consequent growth in competence.

Recently, the effect of flipped learning method in the Iranian ESP setting was reported in the literature by Fard et al., (2021). The researchers aimed to determine whether teaching ESP vocabulary in a flipped classroom would enhance Iranian ESP students' vocabulary learning. Also, the perspectives of ESP students towards the use of flipped classrooms were examined. While the students in the experimental group were taught using a flipped classroom model, the ones in the control group were given vocabulary training using the traditional approach. The findings showed that ESP students had improved possibilities to learn vocabulary thanks to the use of flipped classrooms, and the researchers argued that students in the study group performed better due to the greater number of interactions they had.

The most recent attempt to develop a better understanding of ESP vocabulary learning has been made by Duong (2022) who explored ESP vocabulary learning strategies of 270 Vietnamese students. The results showed that participants used learning strategies for ESP lexical words to a modest extent. The findings also showed that participants employed vocabulary learning strategies (VLS) for ESP due to their effectiveness and frequent practice, whereas the use of VLS for ESP was hampered by a lack of confidence and a conducive practice environment. Considering these findings, the researchers suggested that ESP teachers encourage their students to use VLS for ESP more regularly.

The aforementioned studies are seminal contributions to the research into ESP vocabulary learning in a number of contexts, and similar work has also been pursued to explore this issue in aviation context (Atay & Ozbulgan, 2007; Dinçer & Dinçer, 2021; Fainman & Tokar, 2018, 2021; Fursenko et al., 2021). The earliest contribution was made by Atay and Ozbulgan (2007) who examined the impact of context-based learning and memory technique teaching on ESP vocabulary recall. The participants in their study included fifty male Army Aviation pilots who were enrolled in the Turkish Army School of Languages' Air Traffic Terminology and Phraseology Course. Students in the experimental group were offered memory technique instruction whereas the ones in the control group were instructed vocabulary only through context. The researchers found out that the experimental group students had considerably higher vocabulary gain scores than the control group.

A more recent contribution looked at how incorporating real movies in ESP classes affected students' vocabulary learning (Fainman & Tokar, 2021). 48 third-year students from the Flight Academy of the National Aviation University in Ukraine made up the participants in this study. The researchers split the participants into two groups, each with 24 students: the control group and the treatment group. For 12 weeks, both groups took Aviation English sessions. The treatment group was given the identical tasks along with the same authentic movies, each lasting around 10 minutes and relevant to air crash investigations, whereas the control group received instruction through conventional communicative means. The results demonstrated that on the post-test, the students who had seen real films fared statistically better than the control group. Based on the findings, the researchers drew the conclusion that ESP instructors may facilitate vocabulary learning through the use of real video content. In a similar vein, Fursenko et al., (2021) integrated Quizlet into Aviation English course in the same context of Ukraine for the purpose of testing the efficiency of using this computer-based flashcard tool to teach future air traffic controllers (ATCOs) ESP vocabulary. 57 first-year students made up the sampling in their experiment. According to the empirical data, Quizlet was found as a useful vocabulary learning tool that improved students' speaking ability and interest in learning aviation English. The researchers further asserted that vocabulary acquisition was the foundation for foreign language learners' general language proficiency, which contributed to the growth of oral communication abilities.

The most recent research into ESP vocabulary teaching focused on the integration of a serious game into Aviation English course in Turkish context (Dinçer & Dinçer, 2021). The researchers instrumented X-Plane version 11 as the instructional tool to teach the target vocabulary to achieve quantifiable outcomes and to combine game mechanics with educational goals in the pursuit of the intended learning outcome. By using convenience sampling, their analysis used a quasi-experimental mixed-method design with 15 subjects in both the experimental and the control groups. Based on the findings, the researchers reported compelling evidence that serious gaming facilitated ESP vocabulary learning. The researchers also reported findings of their qualitative data analysis highlighting a consensus on the effectiveness of serious gaming in ESP vocabulary teaching despite some challenges including the level of language, hardware, and software.

Judging from the review of literature on Aviation English vocabulary teaching, it can be hereby argued that the work in this arena generally concerns itself with the pursuit of empowering and facilitating the vocabulary learning for ab initio trainee controllers as well as student pilots. Along similar lines with this pursuit, the present study aims to extend the literature by exploring an uncharted area of Aviation English vocabulary teaching research. Accordingly, a simulation-based training will be integrated into an Aviation English course to test its influence on the acquisition of target aviation vocabulary by student pilots.

2.3 Simulation in Aviation

For many in the aviation industry, the word “simulation” conjures up visions of complex computer-generated replicas that closely replicate the look and feel of the cockpit. Even more modest beginnings were made for simulation. Shortly after the inventions that enabled engine-powered, controlled flight in the late 19th century and early 20th century, the possibilities that flight might offer expanded. Manned flight was quickly adopted for many more civilian and military purposes in addition to transportation, making it no longer the exclusive domain of a small group of intrepid individuals who flew for novelty’s sake. As soon as the aviation industry began to grow, questions regarding how to teach pilots effectively arose. However, before beginning actual flight training exercises, the majority of early pilots were required to listen through lectures in class. Due to the infancy of flight training, even the experienced pilots of that time might have viewed flying as risky. Understandably, this risk was higher for inexperienced student pilots. Because of the tremendous cost of lives and airplanes lost during flight trainings, flight simulators were developed to promote safety in training (West & Lane-Cummings, 2007).

For people working in the aviation industry such as pilots, air traffic controllers (ATCOs), maintenance, ground operations, and safety board, simulation-based training is crucial. These positions require skilled and knowledgeable employees to carry out extremely experienced and knowledge-based activities. Aviation training, which is typically provided in training facilities, technical schools, or community colleges, develops industry competence through a combination of practical experience and classroom learning. Yet, the high likelihood of making mistakes in the field presents difficulties, particularly for aspiring pilots, as they may result in a disastrous

accident. Hence, the use of simulation in aviation training has received careful consideration because a simulation, like a flight simulator, is a computer-generated imitation of the real thing (Lee, 2017). Students benefit from having real-world experiences in a classroom setting. In other words, by using technology for training or education, a scenario or procedure is reproduced. Simulation is frequently used when the real system or environment cannot be used, such as when it is unavailable or possibly dangerous (Kuofie & Suman, 2021).

In addition, simulations show the actual outcomes of different situations and actions. It is, therefore, referred to as a method for making it easier to understand how to handle real-world circumstances. Prior to participating in actual pilotage, it is advised by experts in aviation to engage in computer-based simulations of various circumstances. As a result, simulation-based training is used as a teaching and learning strategy that draws on first-hand experience and enables critical thinking and reflection. By incorporating simulations into the learning environment, a noticeable difference is evident. Research on the effectiveness of simulation in the aviation areas has produced high-quality results (Jentsch & Curtis, 2017). However, researchers and practitioners must have a solid understanding of what is known about how simulation affects training. With this knowledge, professionals and academics can create training programs that are more useful and carry out research that will guide the use of simulation in the future expansion of the aviation industry.

Simulation offers the opportunity to apply theoretical knowledge in real-life situations, and it is an effective approach to develop complex skills. Therefore, it has been integrated into several different ESP settings including nursing (Sanford, 2014), engineering, medicine, psychology, (Fisher et al., 2011), and chemistry (Cai et al., 2014). Although simulation technology has been widely used in the aviation industry for military and commercial purposes. Traditionally, pilots' simulation sessions included basic flight training, combat maneuvering training, instrument training, decision-making training, and crew resource management (Salas et al., 1998). With the developments in simulations and simulators, pilots and student pilots now attend a number of simulation sessions where they apply theoretical knowledge into practice. However, no use of simulation has been noted in the aviation industry for the purpose of developing pilots' English language proficiency. This may be associated with the cost and challenge of designing and developing simulations for such a purpose. Alternatively, the adaptation of existing software and hardware for language teaching

in aviation appears to be a challenge to be taken on by ESP researchers. Bridging the gap between the challenges posed by adapting existing software and hardware for aviation language teaching, serious games are used for instructional purposes. In this sense, Microsoft Flight Simulator, a serious game, was instrumented in the present study for simulation purposes.

Serious games are “a genre of digital games meant to engage and push players to learn or solve issues while having fun,” according to Michael and Chen (2005, p. 17). A similar definition of serious games is provided by Djaouti and his colleagues (2011, p. 27): “Games that do not have entertainment, enjoyment, or fun as their primary purpose, but rather the acquisition of knowledge, skills, attitudes, or behaviors that are not necessarily related to the game context.” These definitions emphasize the serious games’ educational and informative aspects, emphasizing their potential as useful teaching and learning tools. They are meant to educate and inform players about a specific topic or skill. Serious games can also be used to imitate actual events, giving students first-hand experience that can help them apply what they have learned in real-world settings. Since these games may engage and motivate students while improving their learning outcomes, serious games have gained popularity in the education industry. From elementary school to higher education and professional development, serious games are employed in a range of educational contexts since they offer students the chance to practice problem-solving techniques, critical thinking, and teamwork while also being able to be customized to meet specific learning objectives. The study conducted in a Saudi Arabian higher education institution by Yanes and Bououd (2019) further revealed similar opportunities English language learners can get by means of serious games. These included continuous self-learning, no social or gender discrimination, meaningful learning, and inspiring learners for self-discovery. With regard to vocabulary acquisition through serious games, the study by Ranalli (2008) reported on two groups of students’ receptive and productive vocabulary knowledge. The findings showed that those who played the SIMs serious game made the biggest improvements compared to those who did not play the same game. In a similar vein, Chen et al., (2018) concluded that serious games positively contributed to vocabulary acquisition of tertiary level English language learners in Taiwan. Another contribution of serious games in instructional settings was reported by Johnson et al. (2005) on learners’ communicative skills. They concluded that players’ communication skills as well as their cultural knowledge improved through simulated conversation with non-

player characters. Lastly, a recent study in the Taiwanese context offered insights into the use of serious games in English language learning. Chen and Hsu (2019) experimented with sixty-six CEFR B2 level non-English major students in a Taiwanese national university. The findings showed that playing the serious game called *Playing History* significantly improved learners' vocabulary scores. Furthermore, learners reported their experience as a positive learning experience. It can be inferred from the aforementioned studies that simulation and serious games can be effective instructional tools for English language learning.

Having presented the research into listening and speaking skills in aviation as well as vocabulary development and simulation-based training, the following subheadings will describe the readback performance and willingness to communicate in aviation.

2.4 Readback Performance in Aviation

In aviation communication, “readback” is the act of a pilot repeating or confirming a message or clearance received from the air traffic controller (ATCO). Effective communication in the aviation sector relies heavily on this approach, which guarantees a mutual comprehension of instructions, clearances, and information transmitted between the pilot and the controller during flight operations. When the ATCO provides instructions to a pilot, such as granting permission for takeoff, specifying a different altitude, or assigning a new heading, it is mandatory for the pilot to repeat the information back to ensure its correctness. The purpose of this readback is to provide confirmation to the controller that the pilot has accurately received and comprehended the orders provided. In this sense, the readback procedure is the key to maintaining the safety of any flight operation.

A common protocol for a readback entails the pilot reiterating the pertinent components of the transmission, encompassing the aircraft's designated identification, the instruction or clearance received, and any specified particulars. For instance, a readback could include the designated altitude, heading, or other characteristics specified by the ATCOs. The readback procedure is essential for mitigating misconceptions and reducing the likelihood of errors in air traffic control directives. It enhances safety in aviation operations by fostering a mutual understanding of the

situation between pilots and controllers, hence improving the effectiveness and dependability of air traffic management.

Language, cognition, social interaction, environment, technology, and organizational issues are all important in the complexity of communication. Nonetheless, this confluence of factors determines whether communication is successful or unsuccessful through language. Because of this, language-related concerns, such as use, competency, and standardization, have become top priorities for a number of parties, including pilots and controllers, national civil aviation authorities, and the International Civil Aviation Organization (ICAO).

The safe and effective flow of air traffic into and out of airports served by control towers is the responsibility of air traffic control. Radiotelephony is the most common tool used by air traffic controllers to communicate with pilots both on the ground and in the air. Pilots get orders from controllers in the form of clearances, which include navigational instructions, altitudes, speeds, weather information, and other data. Pilots must obey controller directions unless doing so puts the safety of the aircraft and its passengers in jeopardy. Careful air traffic management is essential, especially in and around large airports. So, the coordination of the flight depends on the controller and the pilot exchanging accurate and full information. Incidents and accidents can happen when a pilot misunderstands or simply does not hear a controller's directive, or when a controller errs by granting a clearance to the incorrect aircraft or neglecting to issue a clearance. Therefore, pilots and controllers all around the world are particularly concerned about having effective communication with ATC. Because of this, a unique code known as standard phraseology has developed specifically for radiotelephony communications.

There are occasions when pilots and controllers need to address matters outside the scope of conventional phraseology, even though it covers a wide range of routine and non-routine situations. There are also issues with communicating in a second language for people working in situations where they do not share their interlocutor's native tongue. Originating from these reasons, pilots may fail to comprehend the instructions of air traffic controllers and thus, they may make readback errors. Prinzo et al. (2006) define these errors as a pilot's fruitless attempt to correctly read back the data from the communication components that make up the first message sent by air traffic controller. Although the type of these errors may vary, errors of replacement, transposition, and omission are among the more common ones. Prinzo and Hendrix

(2006) argue that there may be some readback faults that are more dangerous than others for user safety. For instance, changing a number in a topic relating to aviation may occasionally pose a greater threat than leaving one off or using a synonym for an anchor phrase. In addition, according to research by Morrow and Prinzo (1999), pilot readback errors and communication issues become more frequent as controller communications advanced in complexity.

Since human beings are limited in their cognitive capacity, pilots sometimes have trouble in processing ATC instructions when these instructions cognitively overload them. The aviation industry has long been investigating the readback performance of pilots. Accordingly, several attempts have been made by scholars to identify the contributing factors to this issue and thus improve pilots' readback performance. For instance, two reports were presented by Prinzo et al., (2006, 2009) to the Federal Aviation Administration of the USA. These reports mainly argued that the complexity of air traffic instructions as well as the length of the instructions led to the increase in readback errors. On similar grounds with Prinzo and Hendrix (2006, 2009), Lynn et al., (2003) reported that the length of messages significantly influenced pilots' readback performance. They argued that the accuracy of readback and execution performance decreased for transmission lengths more than three instructions. They further recommended that air traffic controllers only issue a maximum of three instructions at a time. In addition to these conclusions, Barshi and Farris (2013) offered a comprehensive analysis of the cognitive processes influencing the comprehension of the ATCO's instructions and suggested that air traffic controllers send separate messages if they need to transmit more than three instructions at once. Although the positive influence of simulation and serious games are acknowledged by scholars for flight training purposes, serious thought has not yet been given to train ab-initio pilots by integrating simulation and serious games into pilot training programs so that prospective pilots develop an understanding of the radiotelephony communication and practice the readback procedures before they actually sit in the cockpit. The present study will, therefore, report on the first simulation integration into a pilot training program for the purpose of improving ab-initio pilots' readback performance.

2.5 English Speaking Anxiety

The construct of anxiety has received a lot of attention as one of the most crucial affective factors in the learning of second or/and foreign languages and various definitions of it have been suggested. While Scovel (1978), for instance, argued that anxiety is a sensation of unease that could be trepidation, an uncertain dread stemming from an unexplained fear, or both, Spielberger (1972) defined it as the self-reported experience of tension, fear, nervousness, and worry brought on by an autonomic nervous system arousal. Another definition of anxiety was offered by Fox (1993) who stated that it is a sensation that arises when someone feels unsafe or when certain health and societal issues are present. Building on these definitions, it can be hereby argued that despite variations in the definitions, they all relate to this particular construct as an unpleasant emotional condition marked by feelings of tension and fear. Since it is a common and quite common feeling, it is impossible to avoid facing it during the learning process. Therefore, anxiety has been reported to have a crippling effect on learning of second or foreign languages and to be significantly influenced by a number of affective variables (MacIntyre & Gardner, 1991).

According to Woodrow (2006), anxiety often is categorized as a trait or state anxiety. He further argues that an extremely consistent personality feature is trait anxiety, and an anxious person is likely to experience anxiety in a range of circumstances. On the other hand, state anxiety, on the other hand, is a momentary condition that people experience. However, Spielberger et al., (1976) argue that there exists a third type of anxiety called situational anxiety. This exhibits a characteristic that recurs in certain circumstances. Horwitz (2001) suggested that language learning anxiety should be categorized as being situation specific. In this sense, it often occurs in settings where people are learning languages.

Language learning anxiety is the precise sort of anxiety that is most strongly associated to learning a foreign language (MacIntyre & Gardner, 1989). They have also proposed that language anxiety is separate from other types of anxiety and that it is experienced specifically and exclusively while learning a foreign language. As a form of anxiety, foreign language anxiety (FLA) can be described as being complex and multidimensional (Young, 1991) and as the state of anxiety and unease that is particularly prevalent in situations involving the use of a second language, such as speaking, listening, and learning (MacIntyre & Gardner, 1994). Similar to the umbrella

term of anxiety, FLA is known to influence many people at all levels of language acquisition negatively. It serves as an emotional filter that prevents the pupil from responding to verbal input (Krashen, 1980). Similarly, negative effects of FLA on language achievement (Gjergo & Meçe, 2022), course grade (Alsalooli & Al-Tale, 2022), oral performance (Akbar et al., 2018), vocabulary acquisition (Hamamrad, 2020), and on many other variables have been frequently reported in the literature.

Speaking a foreign language itself is a totally distinct reason for some learners. Since speaking skill is significantly affected by the construct of anxiety, it needs to be specially treated with regard to learning English as a second / foreign language. To address this more specific issue relating to foreign language students' anxiety in the classroom, a growing body of literature has started to focus on English speaking anxiety, which is one of the four variables under investigation in the present study. For instance, 313 randomly chosen Chinese ESL first-year university students in Hong Kong were studied by Mak (2011) for the causes of their speaking-in-class anxiety. The study offered proof that students' unfavorable opinions of language instruction and their low self-esteem are the main causes of speaking-in-class anxiety. For encouraging Chinese students to speak out in English-language classes, the author particularly highlighted the influence of adequate wait-time in lowering fear. In another instance, Akkakoson (2016) reported speaking-in-class anxiety in Thai EFL students at a moderate level. The researcher also concluded that the most significant reason for their English-speaking anxiety was the limited vocabulary knowledge. Therefore, developing vocabulary repertoire of Thai EFL students was suggested as a potential solution to overcome English speaking anxiety. In a similar line, El-Sakka (2016) conducted research in the Egyptian context for the purpose of reducing the English-speaking anxiety of EFL learners at Suez Faculty of Education. At the end of a three-month-long self-regulated strategy treatment, the researcher compared the pre- and post-test scores of Egyptian EFL learners on speaking anxiety and found a significant positive contribution of self-regulated strategy treatment on reducing English speaking anxiety. In addition to this research in Egypt, Suleimenova (2013) reported on the reflections of English-speaking anxiety in the Kazakh context. The findings showed that the educational system in Kazakhstan is not intended to help students become more proficient communicators and thus, many students feel uneasy and anxious when required to communicate in a foreign language. These studies have all showed that anxiety, particularly English-speaking anxiety, is multifaceted yet it is

possible to reduce it for a more fruitful EFL/ESL learning experience. Despite this growing body of literature on English speaking anxiety in EFL /ESL contexts, studies on the role of this construct in ESP context are lacking in the main literature. Therefore, the present study will be one of the pioneering studies that explores the reflections of English-speaking anxiety in an ESP context, namely Aviation English.

2.6 Willingness to Communicate

The concept of willingness to communicate has been analyzed in relation to L1 and L2 for a long time. As an individual difference, it needs to be interpreted by focusing first on the concept of communication. It is widely known that communication, which is essential to practically every area of our lives, is crucial for the development of interpersonal relationships (Sallinen-Kuparinen et al., 1991). Having its origins in the Latin word "communis," communication means "to share." It is a complicated process that considers a number of message-related factors, including behavioral, nonverbal, and verbal features, as well as the setting in which the communication takes place, the speaker's personality, and the audience's and speaker's traits (Pearson et al., 2003). Providing a great degree of flexibility for expressing thoughts, ideas, and information, language has been strongly associated with the concept of communication. Accordingly, WTC began to emerge in the L1 communication studies as early as 1970s. The emergence of the concept of WTC is reported to date back to 1976 when McCroskey and his associates expanded the concept of unwillingness to communicate (MacIntyre et al., 1999).

The definitions offered to the concept of WTC varied. For instance, McCroskey (1992) conceptualized it as the desire to converse with others when provided the chance and defined it as a person's personality-based propensity to initiate contact when given the chance or to resist it when given the chance. Despite having originated in and having been widely studied in relation to L1 communication, the concept of WTC started to be the point of interest for L2 researchers in the late 1990s. Accordingly, L2 WTC was conceptualized as a construct in which psychological and linguistic aspects are organically interwoven (Oz, 2014). What is more it was further defined as "a composite identity variable that draws together a host of learner characteristics that have been well-established as impacts on second language acquisition and usage" (Dörnyei, 2005, p. 208).

A L2 WTC model (Figure 1) was created by MacIntyre et al., (1998) including a variety of linguistic, communicative, and social psychological variables that could affect a learner's communicative behavior. At the base of the pyramid, as depicted in the picture, are relatively fixed factors, such as personality and intergroup climate. At the pinnacle of the pyramid, there is authentic L2 usage in a specific context. Between these two extremes, a number of situational and contextual elements interact with learner traits such as communicative ability and/or L2 self-confidence. From the pyramid's apex to its base, the levels represent a progression from the most immediate, situation-specific variables to the more constant, long-lasting influences on the L2 communication process. This approach proposes that a vast variety of environmental and individual factors interact at any given instant to determine whether a learner uses the L2 or not.

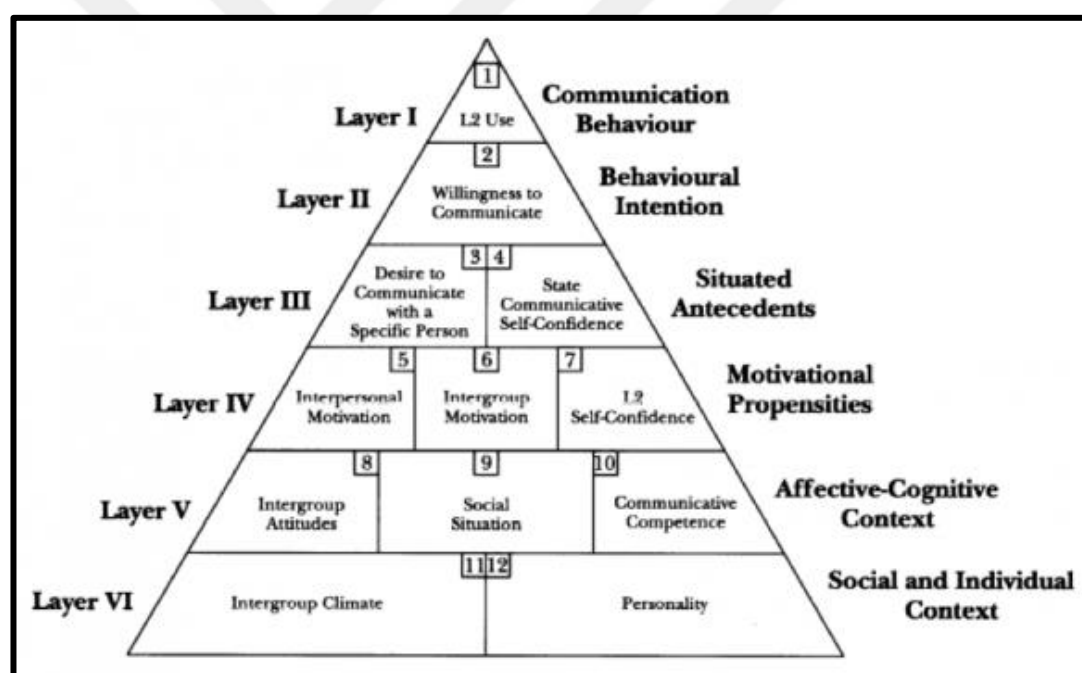


Figure 1. The heuristic model of L2 WTC

Building on this model, the concept of WTC was further examined from two perspectives: the trait and state perspectives (MacIntyre et al., 1999). According to the former perspective, it is regarded as the lasting influences, or learners' consistent personalities across time and in various circumstances whereas the latter perspective regards it as transitory and flexible across circumstances. This differentiation of WTC between trait and state can also be observed in other individual difference variables

such as motivation and anxiety. Therefore, it can be argued that WTC in the target language can be influenced by several factors both directly and indirectly. Considering the fact that the objective of second language (L2) and foreign language (FL) learning is to improve communication and mutual understanding amongst individuals from diverse cultural origins and who speak different languages, it becomes crucial to identify the influence of WTC in L2 learning settings.

L2 WTC is regarded as the most direct predictor of L2 usage in various contexts (Clément et al., 2003). For instance, the study conducted by Kim (2004) investigated the WTC, confidence, motivation, and attitudes. Apart from the correlations between attitude and WTC in L2, the results revealed substantial relationships between the aforementioned constructs. The WTC of Korean university students was thought to be related to their confidence in English communication and indirectly related to their attitudes and motivation via confidence in English communication. Later, Bukhari and Cheng (2017) reported on an ESL context. Their study focused on 196 Pakistani students in Canada and showed that they were highly willing to communicate in English wherever they had possibilities to do so. Their study supported the fact that WTC is influenced by the L2 learning setting.

With regard to the Turkish setting, the following findings have been reported. Bursalı and Oz (2017), for instance, concluded that English learners of Turkish origin had a moderate degree of WTC. Later, Sak (2020) reported that 28% of EFL learners in Türkiye had high L2 WTC outside of the classroom, while 24% had high L2 WTC inside the classroom. More recently, Şen and Oz (2021) revealed that 32% of the participants had high levels of L2 WTC in the classroom, 54% had moderate levels, and 14% had low levels. Besides, researchers found a strong correlation between the vocabulary level of the participants and their WTC in the classroom. The most recent research into L2 WTC in Turkish setting showed that the most important indicator of readiness to communicate was communication confidence (Yıldız, 2022a). This finding was associated by the researcher with the argument that if Turkish EFL students feel confident in their ability to communicate and have less nervousness, they will be more open to speaking in class. The aforementioned studies all show the multifaceted nature of L2 WTC and its correlation with various other variables in EFL/ESL settings. However, research on L2 WTC has been mostly restricted to these settings, and the role of L2 WTC in ESP settings has received limited attention in literature.

One of the limited attempts on this matter explored WTC in Serbian ESP setting with a purpose of evaluating the students' WTC both within and outside of the classroom and determining the extent to which attitudes toward studying L2 and self-perceived competence have an impact on the ESP students' WTC (Halupka-Rešetar et al., 2018). The findings in that study showed a relatively high level of WTC in English, which was similar to the findings in EFL/ESL settings. Similarly, the studies conducted in the Iranian ESP context (Karimkhanlooei et al., 2022) and in the Indonesian ESP context (Sjaifullah & Laksmi, 2022a) reported that WTC is a complex and multifaceted construct that is affected by classroom activities, tasks, and teaching materials.

The research into WTC in Turkish ESP setting is even more limited since the study of Uyanık (2018) is the one and only attempt to my best knowledge. In her study, the researcher reported on the WTC levels of 353 ESP students enrolled in aircraft technologies, civil aviation cabin services, and ground handling services management programs of a tertiary level institution in Türkiye. This study showed a moderate level of WTC in English. In addition, ESP learners were more likely to talk to their professors or peers; when they were among a small group, they were also willing to speak English, and they were more inclined to use English when there were fewer interlocutors present, but less inclined to talk in front of others or with a large group of people. The fact that EFL/ESL students are highly willing to communicate in English in the classroom was also supported this study in that ESP students' in-class WTC in English was also high. Building on the review of the literature undertaken, it can be concluded that the multifaceted nature of WTC in English is apparent both in EFL/ESL context and ESP context. However, the sheer volume of research into WTC in English still fails to shed light on the reflections of WTC in aviation English. Considering that communication is vital in aviation, the present study will make a great contribution to a better understanding of the influence of WTC in English on ab-initio pilots' communicative competencies.

2.7 The aviation industry in Türkiye

Türkiye has strategically established itself as a growing center for aviation, characterized by significant investments in the construction and enhancement of its airports and aviation infrastructure. An important milestone in this progression was the

establishment of Istanbul Airport in 2018, quickly establishing its position as one of the largest and most significant aviation centers globally. Central to this aviation environment is Turkish Airlines, the primary airline of the country and a significant international participant. Turkish Airlines, known for its extensive network, has substantially expanded its flight operations to many international locations, thereby bolstering the country's rising prominence in the global aviation industry.

The increase in aviation operations in Turkey has led to a growing need for proficient pilots. As a result of increasing demand in the industry, there has been a significant increase in the popularity of aviation English courses nationwide. Various universities have taken advantage of the chance to provide specialist courses, acknowledging the vital importance of excellent communication in aviation. These programs are designed for ambitious student pilots who are not only enthusiastic about gaining the required technical skills but also understand the significance of becoming proficient in aviation English in order to successfully integrate into the aviation sector. Consequently, these endeavors are not only fostering the acquisition of expertise among aspiring pilots, but also bolstering Turkey's reputation within the international aviation sphere. Turkey's dedication to cultivating a strong and competitive position in the ever-changing field of aviation is evident in its symbiotic connection between infrastructure development, airline expansion, and educational offerings.

The practice in the Turkish aviation industry is regulated by the Directorate General of Civil Aviation (DGCA). The regulatory framework is established to guarantee the safety, security, and adherence to international aviation norms. This institution is the only authority to issue pilot license in Türkiye. In addition to overseeing the correct implementation of legal aviation regulations within the borders of Türkiye, the DGCA is also responsible for abiding by the regulations dictated by the ICAO which required all pilots to perform at minimum level 4 or higher in the English Language Proficiency Test as of 2008. Therefore, apart from the academic, psychological, and health requirements, all pilot candidates in Türkiye are now required to pass this test in order to be eligible for the pilot license. However, neither the DGCA nor the ICAO has authority on the regulation of academic studies to become a pilot in Türkiye. Rather, these studies are overseen by the Council of Higher Education (CoHE).

According to the Council of Higher Education, as of June 2023, ten institutions offer pilotage programs in Türkiye (Table 1). While nine of these institutions are

foundation universities, only one of them is a state university. All institutions offer four-year-long undergraduate programs. While Turkish is the medium of instruction in three of these institutions, English is the medium of instruction in the remaining seven institutions.

Table 1

Turkish Higher Education Institutions Offering Pilotage Programs

Institution	Faculty	Type of Institution	Type of Program	Medium of Instr.
Antalya Bilim University	School of Civil Aviation	Foundation	Undergraduate	TR
Atılım University	School of Civil Aviation	Foundation	Undergraduate	EN
Bahçeşehir University	School of Applied Disciplines	Foundation	Undergraduate	EN
Eskişehir Tech University	Faculty of Aeronautics and Astronautics	State	Undergraduate	TR
Istanbul Aydın University	School of Applied Sciences	Foundation	Undergraduate	EN
Istanbul Okan University	Faculty of Applied Sciences	Foundation	Undergraduate	EN
KTO Karatay University	School of Applied Sciences	Foundation	Undergraduate	TR
Nişantaşı University	School of Civil Aviation	Foundation	Undergraduate	EN
Özyeğin University	Faculty of Aeronautics and Astronautics	Foundation	Undergraduate	EN
Turkish Aeronautical Association University	Faculty of Air Transport	Foundation	Undergraduate	EN

With regard to the Aviation English courses offered in these undergraduate programs, there is no consensus on when to offer these courses (Table 2). As can be seen below, seven of all institutions offer Aviation English courses as part of the pilotage program. However, three institutions do not offer any courses dedicated to teaching Aviation English. Rather, these three institutions offer English courses that

aim to develop overall English language proficiency of the student pilots enrolled in pilotage programs.

Table 2

Aviation English Courses Offered in The Pilotage Programs in Türkiye

Institution	Semesters							
	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th
Antalya Bilim University	-	-	X	X	-	-	-	-
Atılım University	-	-	-	-	X*	X*	-	-
Bahçeşehir University	-	-	X	X	-	-	-	-
Eskişehir Technical University	X	X	X	-	X	X	-	-
Istanbul Aydın University	X**	X**	-	-	-	-	-	-
Istanbul Okan University	-	-	-	-	-	-	X	-
KTO Karatay University	-	-	X	X	-	-	-	-
Niğantaşı University	-	-	-	-	X	-	-	-
Özyeğin University	X***	X***	-	-	-	-	-	-
Turkish Aeronautical Association University	X	X	-	-	-	-	-	-

* English for Occupational Purposes I & II courses is offered instead of Aviation English course.

** Professional English I & II courses are offered instead of Aviation English course.

*** English Speaking Skills I & II courses are offered instead of Aviation English course.

The current state of undergraduate pilotage programs in Türkiye clearly shows that higher education institutions adopt different approaches to the design and development of curriculum for the pilotage programs.

Chapter 3

Methodology

This chapter offers detailed description of the research design of the current study. First, a summary of the philosophical research paradigms are presented. Then, the research design adopted in this study is thoroughly discussed. It is followed by data collection tools, data collection process, and data analysis, respectively. Finally, this chapter concludes with validity and reliability titles.

3.1 Philosophical Research Paradigms

The paradigm is defined as "the mutually accepted set of beliefs and practices that govern a field" (Morgan, 2007, p. 49). It is, therefore, the collection of viewpoints and hypotheses that scientists have agreed upon regarding how problems can be fathomed. Doyle et al., (2009) further argues that any research paradigm that a researcher adopts solidifies that researcher's worldview. In this sense, the three most prevalent paradigms are positivism, constructivism, and pragmatism. While positivism holds that there is only one reality that can be understood through the application of quantitative techniques, constructivism promotes the notion that there is no one true reality. Constructivists, therefore, believe that in order to interpret these many realities, qualitative methodologies should be used. The reality, according to pragmatism, is constantly being argued and understood, hence the best approach is the one that finds a way to comprehend reality. Overall, constructivist and positivist paradigms are the foundations of quantitative and qualitative research methods respectively, which are the two most popular research methods.

On the one hand, quantitative research is defined as the meticulous analysis of miracles through the collection of quantifiable data and the application of measurable, scientific, or computational processes (Creswell, 2003). It collects information from current and potential samples using testing methodologies and disseminates online reviews, surveys, polls, and other data, the results of which can be represented statistically. Singh (2007) argues that the majority of quantitative research is conducted in the social sciences to obtain quantitative data, and during this method of investigation, researchers present scientific theories and hypotheses related to the

subject matter. This inquiry technique produces logical, factual, and impartial results (Dörnyei, 2007). Data is gathered in an organized manner, with a focus on broad examples that apply to the entire population. Similar to the first phase of the current investigation, the study's nature made quantitative research methods selected. The objective was to compile data on tertiary level ESP aviation English students' speaking anxiety and willingness to communicate in English. According to Dörnyei (2007), the major method of data collecting in surveys is the employment of questionnaires. Therefore, two sets of scales were instrumented to fulfill the aforementioned objectives of the present study.

Comparatively speaking, qualitative research is fundamentally exploratory and differs greatly from quantitative research in many respects. For instance, qualitative research is used to understand unspoken motives, judgments, and inspirations. Also, it provides tidbits of information about the problem or generates ideas or hypotheses for possible quantitative research. Moreover, qualitative research is carried out to draw certain findings and delve deeper into the problem. Various methods of acquiring qualitative data using unstructured or hazy systems are used. Focus group talks, one-on-one interviews, and participation/observation are the most often used strategies. When compared to quantitative research, the sample size is typically lower, and respondents are picked to satisfy a predetermined threshold. In summary, using qualitative approaches is a good way to clearly define the focus of a study. Despite the wide range of qualitative research approaches, conducting interviews is still the most popular method of gathering qualitative data (Dörnyei, 2007). To learn more about the perceptions of student pilots toward and their experiences with simulation-based learning method, the qualitative research approach was adopted in the second phase of the current study. In order to do this, focus-group interviews were conducted to strengthen the research study's reliability and support the implications of the study's first phase.

Mixed method research has grown in favor over the past few decades in the social sciences, in addition to the quantitative and qualitative research approaches that are supported by positivists and constructivists. There are numerous ways to understand the world and conduct research, no point of view can ever fully capture it, and there can be multiple realities, according to Saunders et al., (2019). Additionally, Creswell (2003) contested the concepts, methodologies, and standards of quality for studies that apply a combination of qualitative and quantitative approaches, and he

characterized the goal of mixed methods research design as gathering both quantitative and qualitative data, merging the data, and using the results to comprehend a study problem. Johnson and Onwuegbuzie (2004) further argued that it "really opens up an exciting and virtually limitless potential for future research" (p. 20). The pragmatist research paradigm and mixed method research design, which combines a questionnaire and one-on-one interviews, were preferred in light of the pertinent literature because they were considered to be the most suitable tools for the purposes of obtaining answers to the research questions of the current. After describing the theoretical justification for the current study, the mixed methods research design that is adopted in this study will be thoroughly described in the following title.

3.2 Research Design

The present study was designed to explore two issues in the ESP context in two separate phases. The first concern of this study was to test the influence of the integration of a flight simulation software into the Aviation English course for innovating the Aviation English classroom. The second concern was to explore the student pilots' unique learning experience on a flight simulator. Therefore, the mixed-methods sequential explanatory research design was adopted to serve these purposes. According to Ivankova et al., (2006) it includes two phases of data collection and analysis within one study: quantitative and then qualitative, respectively. Creswell (2003) adds that the overarching goal is to use the qualitative information to further explain the preliminary quantitative findings. Accordingly, this study consisted of two consecutive phases: first the quantitative (Phase 1) and then qualitative (Phase 2).

Prior to the commencement of the simulation sessions, Phase 1 encompassed the exploration of the flight simulation program with the gathering of quantitative data. The researcher assessed the level of English-speaking anxiety, readiness to converse in English, and vocabulary acquisition of student pilots both before and after the intervention. Furthermore, the identical group of individuals had continuous evaluation of their readback performance throughout Phase 1. However, the present study did not include any control group due to contextual reasons. That is, the student pilots were enrolled in the pilotage program which has a strict timeline for the simultaneous progress of both the academic courses and pilotage lessons for the attainment of Private Pilot License (PPL-A). Therefore, all students had to be offered

exactly the same course content to comply with the academic regulations of the institution, which led to the adaptation of a quasi-experimental design by the researcher.

Phase 2 encompassed the gathering of qualitative data to examine the learning experiences of student pilots in this distinctive environment. In this study, the mixed method sequential explanatory research design consisted of two phases. The subsequent topics provide a comprehensive discussion of the data collection instruments, setting, and participants.

3.3 Setting

The present study was carried out in the Pilotage department of the School of Applied Sciences of Bahçeşehir University located in Istanbul, Türkiye. Students who apply to this program and qualify to participate in the program must first successfully complete the English Preparatory Program which lasts two semesters. They then enroll in the eight-semester-long Pilotage Undergraduate Program.

During the first three semesters of the program, students are trained as aviators with knowledge of aviation and engineering-based academic courses. Beginning in the fourth semester, they receive theoretical pilot trainings designed in accordance with international standards in real and virtual classes at Bahçeşehir University, which is equipped with modern technical education opportunities.

Prior to the beginning of the fifth term, students complete their first actual flights during the fourth term and become eligible to receive a Private Pilot License (PPL-A). On brand-new training aircrafts and specialized flight simulators, seasoned flight instructors from the partner flight school provide actual flight training. In the subsequent four semesters, graduates receive flight trainings and theoretical pilot trainings according to the specified stages, which become increasingly difficult as their skills increase. In addition to their bachelor's degree, the graduates will also be eligible to receive the Airline Transport Pilot License (ATPL-A) from the DGCA (Directorate of Civil Aviation of Türkiye).

Students who wish to enroll in this program are required to submit a Class-1 health certificate issued by an aviation medical center authorized by the General Directorate of Civil Aviation (DGCA) and a health certificate stating that there are no restrictions on their ability to fly as a responsible pilot in certified aircrafts. Pilot

candidates' criminal record registrations must meet the requirements outlined in Article 24 of the Aircraft Pilot License Regulation (SHY-1) published in the Official Gazette on June 6, 2006, under number 26190, in order to qualify for an application for a student pilot license.

As stated before, the content of the curricula of pilotage programs in Turkish higher education institutions vary to a great extent. Amidst these variations, the curricula of the pilotage program of the School of Applied Disciplines of Bahçeşehir University, in which the present study has been conducted, is presented in detail below (Table 3).

Table 3

The Curricula of The Pilotage Program of Bahçeşehir University

Program Structure	ECTS*	ECTS (%)	Credit	Credit (%)
Departmental Electives	24	10	12	9,3
General Electives	24	10	18	13,95
Non-departmental Electives	12	5	6	4,65
Must-have Courses	132	55	61	47,29
Must-have Courses Offered by Other Departments	32	13	18	13,96
Common Must-have Courses	16	6,7	14	10,85
Total Credit	240	100	129	100

* The European Credit Transfer and Accumulation System (ECTS)

The table shows that student pilots must get 240 ECTS in order to be eligible for graduation from the pilotage program. The table also shows the distribution of each type of course in the curriculum. For instance, non-departmental elective courses are equal to 12 ECTS and so, they make up the smallest portion (5%) of the pilotage curriculum. These courses are followed by common must-have courses (6,7%), departmental elective courses (10%), general elective courses (10%), and must-have courses offered by other departments (13%). On the other hand, must-have courses

correspond to 132 ECTS of a total of 240 ECTS and so, they make up the biggest portion (55%) of the pilotage curriculum in the target setting of the present study.

With regard to the Aviation English courses offered in the pilotage program, there are two must-have Aviation English courses, namely Aviation English I (PLT2001) and Aviation English II (PLT2002). While the former is offered in the 3rd semester, the latter is offered in the 4th semester. Both courses aim to introduce aviation terminologies to students, improve their key language skills through subject-specific texts and dialogues, and prepare them for the ICAO English Proficiency exam. However, a unique course titled “Simulation-based Pilotage Training” was designed and developed by the researcher for scientific research purposes. The following heading provides detailed information regarding the implementation of this unique course design in the aviation context.

3.4 Implementation

The Simulation-based Pilotage Training course (PLT3019) was exclusively designed and developed by the researcher for instructional purposes. In essence, the influence of the use of simulation technology on student pilots’ development of Aviation English proficiency and their perceptions toward this innovative ESP teaching method were explored. This course was offered in the fall semester of 2022-2023 academic year in the School of Applied Disciplines in Bahçeşehir University. The aim of the course was to teach aviation-related vocabulary through a simulation software and simulate radiotelephony communication as well as the readback procedures while flying an aircraft so that:

- any possible English-speaking anxiety of student pilots can be prevented,
- the willingness to speak English can be positively influenced,
- learned knowledge by means of simulation can be applied effectively in the real work setting,
- and ultimately, the overall English language proficiency with regard to ICAO Level 4 language proficiency requirements can be increased.

This course amounted to 6 ECTS of a total 240 ECTS that must be collected by students throughout the undergraduate Pilotage program. The learning outcomes of the course included:

- developing a good understanding of the parts of aircrafts and being able to describe their functions with a good control over pronunciation.
- developing a good understanding of aircrafts' maneuvers and being able to describe them in English with a correct pronunciation.
- developing a good understanding of all phases of a flight (i.e., Push-back, Taxi, Take-off, etc.) and being able to describe them in English effectively.
- developing a good understanding of flight instruments in an aircraft and being able to describe the data produced by these instruments in English effectively.
- developing a good understanding of the jargon-filled radio communication phraseology and being able to communicate with air traffic controllers effectively by using this phraseology.
- developing a good understanding of air traffic control instructions given by the air traffic controllers during the delivery of clearance, push-back, and taxi as well as being able to take notes and then read them back to the controllers correctly.

The grades in this course ranged between 0-100. Getting a score of 90 or higher resulted in “A” grade letter, which was the highest grade. Whereas those who scored between 85 and 89 received “A-”; between 80 and 84 received “B+”; between 75 and 79 received “B”; between 70 and 74 received “B-”; between 65 and 69 received “C+”; between 60 and 64 received “C”; between 55 and 59 received “C-”; between 50 and 54 received “D+”; between 45 and 49 received “D” which was the lowest grade. Those who received between 0 and 44 were graded “F” which meant that they failed the course. However, receiving a pass grade in this course required meeting a number of criteria:

- Successful completion of 10 simulation sessions amounted to a maximum of 10 points.
- Successful completion of weekly assignments amounted to a maximum of 10 points.
- The mid-term exam amounted to a maximum of 30 points.
- The final exam amounted to a maximum of 50 points.

The Simulation-based Pilotage Training Course lasted 14 weeks (Figure 2) Each session took place between 8:30 a.m. and 12:30 p.m. including three breaks that lasted 30 minutes in total. While Week 1 was reserved for an introductory session to the use of flight simulator, Week 8 and Week 14 were the assessment weeks as previously announced by the institution. Therefore, the experiment with the flight simulator lasted 11 weeks comprising of 10 simulation sessions.

PLT3019 Simulation-based Pilotage Training Course Weekly Plan				
Week	Date	Topic	Readback	Simulation
1	3.10.2022	Integration of flight simulators into Aviation English courses to meet the ICAO Language Proficiency Requirements (LPRs)	-	No simulation session
2	10.10.2022	Getting the ATIS	ATIS	LTFD standard traffic pattern
3	17.10.2022	Parts of airplanes and radiotelephony	Route Clearance, Start-up and Push-back	KJFK - KIAD / Eagle Flight 4410
4	24.10.2022	Pitch & Roll and radiotelephony	Taxi and Line-up	EDDW (taxi+line-up+traffic pattern)
5	31.10.2022	Cruise Flight and radiotelephony	Take-off and initial climb	LICC (initial climb)
6	7.11.2022	Taxi Procedures and radiotelephony	Climb and end of climb	LTFE
7	14.11.2022	Take-off Procedures and radiotelephony	Position report	LPMA
8	21.11.2022	Mid-term Exam		
9	28.11.2022	Departure Procedures and radiotelephony	Descent	Fort of São Julião da Barra (1500 ft) to LPPT RW03
10	5.12.2022	Descent Procedures and radiotelephony	Arrival info ATIS	MYGF (Bahamas)
11	12.12.2022	Landing Procedures and radiotelephony	Final approach and landing	Final approach & Landing LTFM
12	19.12.2022	VFR Flight Procedures and radiotelephony	Full ATC Coverage	LTBQ to LTFJ
13	26.12.2022	VFR Flight Procedures and radiotelephony	Full ATC Coverage	LTFD to LTBA
14	2.01.2023	Post-tests and the focus-group interview		
15	9.01.2023	Final Exam		

Figure 2. The implementation plan of the course.

During the simulation sessions, students were sitting in front of a high-end computer which was running the flight simulation software. Depending on the content of each week, students individually assigned a flight mission in which they were required to communicate with the ATCO and fly the aircraft simultaneously by means of the following hardware: a yoke (for controlling the aircraft), throttle quadrant (for controlling the engines), and a headset (for communicating with the ATCO) (Figure 3).

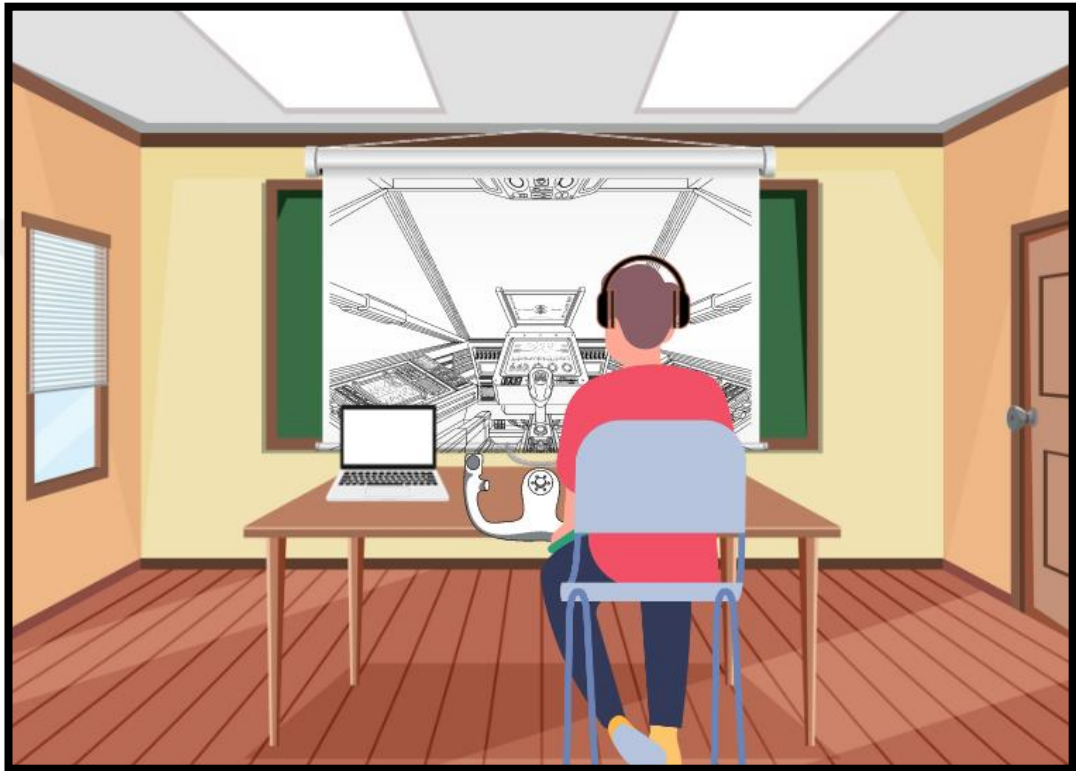


Figure 3. The visual representation of the classroom setting.

In addition to these simulated flight missions, the students were also exposed to implicit vocabulary teaching within the missions. That is, the software introduced various vocabularies related to flight controls, instrument panels of the aircraft, failures in the aircraft, and flight maneuvers before the start of each flight mission. These vocabularies varied depending on the selected flight mission. Then, students were required to complete the assigned flight mission successfully, for which the previously presented vocabularies had to be recognized and made use of. These simulation sessions from Week 2 through Week 11 included the practice of separate phases of a standard flight whereas the simulation sessions in Week 12 and 13 covered the same

phase, a full flight. That is why the last two simulation sessions required a longer time compared to previous simulation sessions for all students to practice a full flight.

Overall, each simulation session included a mission to be accomplished by students. While designing the simulation-based training program, the L2 vocabulary development, readback performance, English speaking anxiety, and willingness to communicate in L2 were explored in the aviation context. The following subheadings will, therefore, describe how these variables were integrated into the simulation-based training in the present study.

3.4.1 L2 vocabulary development. The simulation-based training program implicitly introduced job-specific vocabulary to the student pilots in each simulation session. Since Week 1 was an introductory session to the course and the flight simulation software, the simulation-based vocabulary training started on Week 2. As can be seen in Figure 4, Week 2 presented vocabulary related to Automated Terminal Information System (ATIS), Week 3 focused on the parts of airplane, and Week 4 introduced vocabulary pertaining to pitch and roll maneuvers. The students were indirectly exposed to the vocabularies during the simulation sessions. That is, the simulated flight missions did not include any explicit vocabulary instruction. Although the simulation software utilized in the present study, Microsoft Flight Simulator version 2020, was not particularly developed for flight training purposes, the preset mission flights in this simulation software required users to complete a number of missions which introduced target aviation-related vocabularies. Therefore, the researcher did not decide on the vocabulary to be taught implicitly; rather they were already embedded in the flight simulation.

Week	Date	Topic
1	3.10.2022	Integration of flight simulators into Aviation English courses to meet the ICAO Language Proficiency Requirements (LPRs)
2	10.10.2022	Getting the ATIS
3	17.10.2022	Parts of airplanes and radiotelephony
4	24.10.2022	Pitch & Roll and radiotelephony
5	31.10.2022	Cruise Flight and radiotelephony
6	7.11.2022	Taxi Procedures and radiotelephony
7	14.11.2022	Take-off Procedures and radiotelephony
8	21.11.2022	Mid-term Exam
9	28.11.2022	Departure Procedures and radiotelephony
10	5.12.2022	Descent Procedures and radiotelephony
11	12.12.2022	Landing Procedures and radiotelephony
12	19.12.2022	VFR Flight Procedures and radiotelephony
13	26.12.2022	VFR Flight Procedures and radiotelephony
14	2.01.2023	VFR Flight Procedures and radiotelephony
15	9.01.2023	Final Exam

Figure 4. Vocabulary topics.

3.4.2 Readback performance. The simulation-based training program also included the simulation of the readback procedures while flying an aircraft. Each flight mission was carried out in real time and under live weather conditions so that the student pilots could simulate the real work setting as real as it got.

During each flight on the simulator, the students were introduced to the readback procedure that was in line with the topic of the respective week. For instance, in Week 9, the students were simulating the departure procedures and, in accordance with this topic, they were introduced to the readback procedures during the descent phase of a flight. Therefore, the simulated flight started at 1500 feet above sea level and students practiced the descent procedure into runway 03 at Lisbon Humberto Delgado Airport.

Similarly, in Week 11, the students' mission was to make a final approach into the Istanbul airport and land on the active runway. With regard to this mission, the students were introduced to the readback procedures during the final approach and landing. Throughout all these simulated sessions, the researcher played the role of the air traffic controller (ATCO), and the student was the pilot in command. Since the researcher was experienced in delivering air traffic control instructions, the students were able to simulate radio communication while flying the airplane. In addition, the

radio communication between the ATCO and the student pilot was carried out by means of a headset, just like the real work setting.

At the end of each simulation session, students were given a readback task to be completed online. The Web 2.0 tool called Flipgrid was preferred for this purpose since it was possible for students to post a voice record in which they responded to the air traffic instruction uploaded on the Flipgrid platform each week. The records of ATCO instructions included real exchanges recorded in various airports around the world. Each readback performance task was in line with the topic covered in the simulation sessions, as presented in the weekly plan (Figure 5).

PLT3019 Simulation-based Pilotage Training Course Weekly Plan			
Week	Date	Topic	Simulation
1	3.10.2022	Integration of flight simulators into Aviation English courses to meet the ICAO Language Proficiency Requirements (LPRs)	No simulation session
2	10.10.2022	Getting the ATIS	LTFD standard traffic pattern
3	17.10.2022	Parts of airplanes and radiotelephony	KJFK - KIAD / Eagle Flight 4410
4	24.10.2022	Pitch & Roll and radiotelephony	EDDW (taxi+line-up+traffic pattern)
5	31.10.2022	Cruise Flight and radiotelephony	LICC (initial climb)
6	7.11.2022	Taxi Procedures and radiotelephony	LTFE
7	14.11.2022	Take-off Procedures and radiotelephony	LPMA
8	21.11.2022	Mid-term Exam	
9	28.11.2022	Departure Procedures and radiotelephony	Fort of São Julião da Barra (1500 ft) to LPPT RW03
10	5.12.2022	Descent Procedures and radiotelephony	MYGF (Bahamas)
11	12.12.2022	Landing Procedures and radiotelephony	Final approach & Landing LTFM
12	19.12.2022	VFR Flight Procedures and radiotelephony	LTBQ to LTFJ
13	26.12.2022	VFR Flight Procedures and radiotelephony	LTFD to LTBA
14	2.01.2023	Final Exam	

Figure 5. The weekly plan for the PLT3019 course.

3.4.3 Willingness to communicate. The simulation-based training program aimed to improve the student pilots' willingness to communicate in L2. Since the English Language Proficiency Test of ICAO mainly assesses the communicative skills of pilots, the simulation-based program was designed to expose student pilots to communicative tasks by means of the flight simulation software. Accordingly, the simulated learning environment included ten compulsory flight simulation tasks, all of which required the learners to communicate with an ATCO in English over the radio. Also, each simulation session focused on a different communicative task for the student pilots where they can simulate the radio communication between pilots and

ATCOs as real as it gets. By doing so, the researcher also sought a meaningful and positive change in the level of students' willingness to communicate in L2, which was assessed at the beginning and at the end of the semester.

3.4.4 English speaking anxiety. The researcher designed the simulation-based training program to make room for increased amounts of hands-on experience with the communicative tasks in the real work setting of student pilots. That is, the learners were required to use the English language both inside the ESP classroom during the simulation sessions and outside the ESP classroom to complete the assignments on the readback performance. The English speaking anxiety levels of the learners were, therefore, measured before the start and at the end of the simulation sessions.

3.5 Participants

The present study was conducted with 21 student pilots majoring in the Pilotage program of the School of Applied Disciplines in Bahçeşehir University and enrolled in the PLT3019 Simulation-based Pilotage Training course. Purposive sampling method, which requires the deliberate selection of settings, people, or events (Taherdoost, 2016), was adopted in this study. In this sense, the researcher particularly focused the research on a setting where English is the medium of instruction so that a unique course designed and developed for the research purposes of the present study can be offered in English.

In addition, the researcher offered the Simulation-based Pilotage Training course to a particular group of student pilots who were in their third semester in the undergraduate pilotage program. The reason for selecting this cohort of participants was that, at the time of the study, they had not taken Aviation English I and Aviation English II courses and started the Private Pilot License (PPL) courses beginning in the fourth semester, which would have changed the outcome of the simulation-based training. Finally, the participants had no experience flying in any type of flight simulator which could have negatively influenced the reliability of the study findings. These criteria for purposive selection of participants in this study enabled the researcher to gather invaluable information that cannot be collected from other choices, and it created a unique group of participants that were as homogenous as possible in terms of their background in aviation.

The data regarding the participants' demographic background were collected at the beginning of the semester. Within this scope, participants' age, gender, and prior experience with flight simulators were explored. The analysis of quantitative data regarding participants' gender showed that the research included 17 (81%) male and 4 (19%) female students (Figure 6).

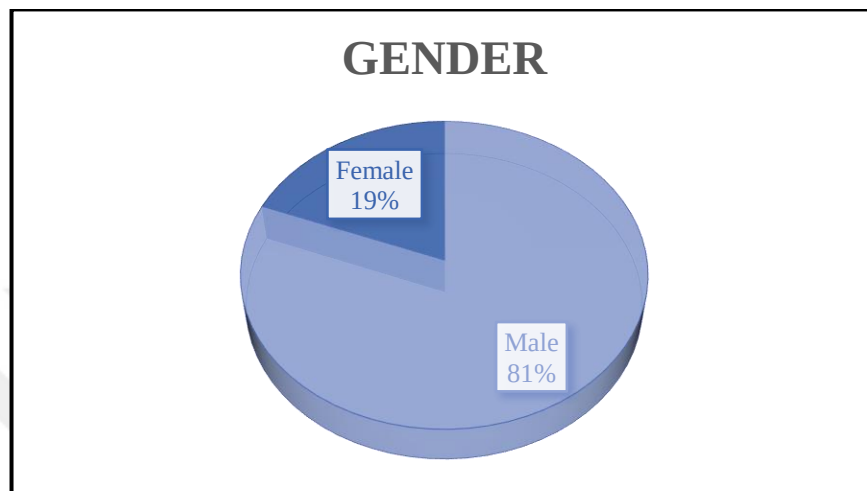


Figure 6. Gender distribution of participants.

It was further explored that participants' ages ranged between 18 and 22, and the mean age was calculated 19,90. While those who were at the age of 20 made up the majority of participants (38,1%), the only participant who was aged 18 formed the minority (4,8%) in the present study (Table 4).

Table 4

The Age Distribution of Participants

Age	Frequency	Percent
18	1	4,8
19	7	33,3
20	8	38,1
21	3	14,3
22	2	9,5
Total	21	100,0

Finally, the students were asked to report on their prior experience with the flight simulation. All 21 students (100%) reported that they did not have any experience flying an aircraft on any type of flight simulation software.

3.6 Data Collection Instruments

The present study adopted mixed methods sequential explanatory research design, and a number of data collection instruments were utilized to seek answers to the questions addressed by the researcher. While the first phase of this study included the collection of quantitative data by means of three data collection instruments, namely the English-speaking Anxiety Scale, the Willingness to Communicate Scale, and the Vocabulary Knowledge Test, the second phase consisted of a focus-group interview. All four data collection instruments are described in the following headings.

3.6.1 Quantitative data collection instruments. Mixed methods sequential explanatory research design required the collection of quantitative data first (Ivankova et al., 2006). Therefore, in the first place, the quantitative data regarding student pilots' English-speaking anxiety, willingness to communicate, vocabulary knowledge, and readback performance were collected.

3.6.1.1 English-speaking anxiety scale. The first quantitative data collection instrument was the English-speaking Anxiety Scale (Appendix A) adapted by Demirdöken and Okur (2023) to the tertiary level. The overall Cronbach's alpha (α) score of the scale was calculated as .93 by the researchers. The same score of the first sub-dimension of the scale was .87 whereas the second sub-dimension's Cronbach's alpha score (α) was .88. In addition, McDonald's Omega reliability coefficient (ω), which yields more reliable results according to Hayes and Coutts (2020), was calculated as .92. The adapted version of the scale was also proved to be acceptable based on the fit indices calculated in the confirmatory factor analysis. The scale includes sixteen items exploring the English-speaking anxiety of tertiary level students.

The responses to the items were based on a Likert-type scale ranging between 1 and 5, in which 1 corresponded to "Totally disagree", 2 "Disagree", 3 "Neither agree nor disagree", 4 "Agree", and 5 "Totally agree". There are two sub-dimensions in the

scale. The first sub-dimension consists of nine items (Item number 1, 2, 3, 4, 5, 7, 8, 9, and 10) whereas the second sub-dimension includes seven items (Item number 6, 11, 12, 13, 14, 15, and 16). Total points that can be collected in this scale ranges between 16 points minimum and 80 points maximum. However, three items (Item number 1, 3, and 9) are reverse items. The higher the participant gets in the scale, the higher his/her English-speaking anxiety is.

3.6.1.2 Willingness to communicate scale. The second quantitative data collection instrument was the Willingness to communicate (WTC) scale (Appendix B) adapted to tertiary level by Uyanık (2018). It was also instrumented in one of his research studies conducted in the aviation context. The overall Cronbach's alpha (α) score of the WTC scale was calculated as .91 by Uyanık (2018) who also reported the reliability coefficient (r) of the scale as .98. It consists of twenty-five items assessing the amount of time in percentage the participant is willing to communicate in four situations, namely public, meeting, group, and dyad, with three types of communicators, namely stranger, acquaintance, and friend. The scale assesses participants' willingness to communicate both inside and outside the classroom and focuses on the speaking aspect of the construct of the willingness to communicate. The responses to each statement are scored based on a scale ranging between 0% and 100% (Table 5).

Table 5

The Scoring Scale for Responses to The Statements on The WTC Scale

0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
I do not want to speak English.			I sometimes want to speak English.					I always want to speak English.		

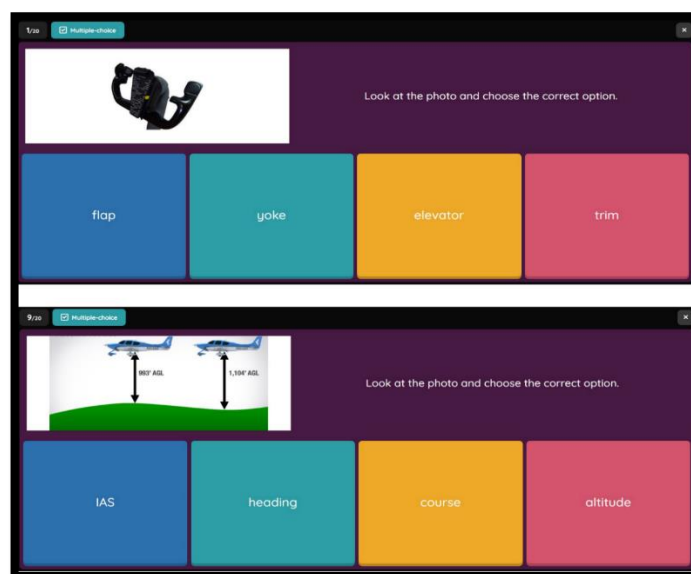
With regard to the overall analysis of each participant's willingness to communicate in L2 both inside and outside the classroom, the score ranges were provided by Uyanık (2018) as follows (Table 6):

Table 6

Score Ranges on the WTC Scale

Level of Significance	Score Limit
Very low	0 – 50
Low	51 – 100
Moderate	101 – 150
High	151 – 200
Very high	201 – 250

3.6.1.3 Vocabulary knowledge test. The third quantitative data collection instrument in this study was the vocabulary knowledge test (Appendix D). The aim of this knowledge test was to assess the overall influence of the simulation sessions on the aviation-related vocabulary knowledge of the participants. The test was designed by the researcher, and it consisted of twenty multiple choice questions (Figure 7). Each question included one of the twenty target aviation-related vocabulary that was randomly picked from the flight missions on Microsoft Flight Simulator version 2020. Total points that can be collected on this test ranged between 0 and 100 since each question was equal to five points. The scores received on the vocabulary knowledge tests were for research purposes only, so they did not have any influence on the overall course grade of the students. Detailed descriptions regarding the validity and reliability of the test were provided in the following titles.

*Figure 7. Sample multiple choice questions.*

3.6.1.4 Readback performance tasks. The third and last quantitative data collection instrument in this study was the readback performance tasks (Figure 8). The purpose here was to determine if simulation-based training had any statistically significant influence on student pilots' readback performance. Overall, the total points that can be collected in these tasks were 100, and the threshold for success was 60, which was determined based on the minimum operational level stated in the ICAO LPRs.

Readback Performance Tasks				
Week	Date	Topic	Task Number	Deadline
1	3.10.2022	Introduction to the course	No assignment	-
2	10.10.2022	ATIS	Task 1	17.10.2022 08:00
3	17.10.2022	Route Clearance, Start-up and Push	Task 2	24.10.2022 08:00
4	24.10.2022	Taxi and Line-up	Task 3	31.10.2022 08:00
5	31.10.2022	Take-off and initial climb	Task 4	7.11.2022 08:00
6	7.11.2022	Climb and end of climb	Task 5	14.11.2022 08:00
7	14.11.2022	Position report	Task 6	28.11.2022 08:00
8	21.11.2022	Mid-term Exam		
9	28.11.2022	Descent	Task 7	5.12.2022 08:00
10	5.12.2022	Arrival info ATIS	Task 8	12.12.2022 08:00
11	12.12.2022	Final approach and landing	Task 9	19.12.2022 08:00
12	19.12.2022	A complete flight	Task 10	26.12.2022 08:00
13	26.12.2022	No assignment	No assignment	-
14	2.01.2023	No assignment	No assignment	-
15	9.01.2023	Final Exam		

Figure 8. The readback performance tasks.

3.6.2 Qualitative Data Collection Instruments. The sequence of data collection in the mixed methods sequential explanatory research design requires the collection of qualitative data in the second phase of the research. Therefore, the qualitative data collection was completed after collecting the quantitative data. In this sense, the semi-structured interview with a focus-group was the main qualitative data collection instrument in the present study. Apart from the interview, the researcher also took substantive field notes at the end of each week. These sources of data provided the researcher with an invaluable source of information for a better understanding of student pilots' attitudes toward simulation-based training.

3.6.2.1 Semi-structured focus-group interview. The semi-structured interview with a focus-group was conducted with five student pilots who volunteered for the interview. The purpose of the interview was to explore participants' learning experiences in this innovative ESP teaching setting.

The semi-structured interview protocol (Appendix E) included twelve questions. While the questions from 1 through 8 aimed to explore participants' overall learning experience, Question 9 addressed the issue of willingness to communicate, Question 10 vocabulary knowledge, Question 11 English-speaking anxiety, and Question 12 readback performance. Since the interview is understanding the experience of the people whose lives mirror such difficulties is a potent way to get insight into education and other crucial social issues (Seidman, 2013), the questions were addressed in participants' native language, which was Turkish, for the purpose of gaining more insights into their learning experiences.

3.6.2.2 Substantive field notes. This collection of notes focuses on the researcher's most important observations, conversations, and interviews. Since it is a personal activity that depends on the research context, research objectives, and rapport with informants, the substantive material frequently includes information about the conditions under which the field researcher collects the data. Therefore, the researcher essentially kept the field notes to maintain recordings of his personal reactions to situations and involvement. Also, it enabled the researcher to portray his personal involvement in the simulation-based training in the aviation context.

3.7. Data Collection Procedures

Data collection was conducted in accordance with the theoretical foundations of the mixed methods sequential explanatory research design. That is, qualitative data collection procedures were followed after completing the quantitative data collection procedures (Table 7). A detailed description of these procedures is provided in the following subheadings.

Table 7

Data Collection Procedures

Weeks	Procedures
Week 1	Assessment of the learners' vocabulary knowledge, English speaking anxiety, and willingness to communicate in L2 (Pre-tests).
Week 2 through 7	Implementation of the simulation-based training program including the readback performance tasks Taking field notes
Week 8	Mid-term exam
Week 9 through 13	Implementation of the simulation-based training program including the readback performance tasks Taking field notes
Week 14	Assessment of the learners' vocabulary knowledge, English speaking anxiety, and willingness to communicate in L2 (Post-tests). Conducting the focused-group interview.
Week 15	Final exam

3.7.1 Quantitative data collection procedures. The quantitative data collection procedure in the present study took place as follows.

Week 1 included the collection of data regarding the learners' English speaking anxiety, willingness to communicate in L2, and the vocabulary knowledge by means of an online form before the start of the implementation of the simulation-based training program. The student pilots were provided with a QR code that gave them access to the Google Form created by the researcher. Before filling in the online form, the participants were informed about the ethical considerations, data privacy, and the content and scope of the study, then they were asked their consent to participate.

Following their consent, the participants were expected to fill in the form and they were reminded that there was no time restriction to answer the questions.

The online form consisted of three separate sections. The first section asked demographic information of participants. Therefore, five questions were addressed to the participants exploring their age, gender, initial attitude toward simulation-based training, prior experience in any type of flight simulator, and the duration of flight simulation experience, if any. The second section of the online form included the sixteen items that made up the English Speaking Anxiety Scale (Demirdöken & Okur, 2023). The third and last section of the online form addressed questions included in the Willingness to Communicate Scale (Uyanık, 2018). Finally, Week 1 included the collection of data regarding the learners' vocabulary knowledge related to aviation, which was collected by means of the vocabulary knowledge test which was conducted online by means of a Web 2.0 tool called Quizizz. The link to the online test was provided to the same cohort of students upon completion of the online form described in the previous headings. The reason for choosing Quizizz to collect data regarding the vocabulary knowledge of participants was that the afore-mentioned Web 2.0 tool was an innovative instructional tool for these cohort of learners. Also, the researcher had prior experience with this tool in ESP teaching settings. Overall, there were twenty multiple choice questions in the vocabulary knowledge test, and the time allocated for each question was 45 seconds. The student pilots were given the opportunity to go back and review their answers before submitting them. Each question described an aviation, a flight instrument, or part of an aircraft. The students were expected to look at the photo in each question and identify the correct word corresponding to the respective photo.

Starting from Week 2 onwards, except the mid-term exam on Week 8 and the final exam on Week 15, the simulation-based training program was implemented by means of the computer-based flight simulation software. During this 11-week-long simulation-based training, each student pilot was required to complete ten tasks on the simulator. After the end of each simulation session, student pilots were assigned a readback performance task. These tasks were accessible on a Web 2.0 tool called Flipgrid which was free to sign up. The students were informed by email as well as through the institution's learning management system as soon as a task is assigned to them. Each task was immediately open to access at the end of each session, and the deadline was the beginning of the following session, which gave student pilots enough

time to complete the assigned task. Each task required learners to listen to an instruction given by an ATC in real life. Then, the learners were expected to comprehend the instruction and read it back appropriately. To do so, they recorded and uploaded their responses to the same digital platform. The reason for preferring this Web 2.0 tool over other similar tools was its convenience to use both on a computer and a mobile phone. This simulation-based program was implemented for eleven weeks, and it ended on Week 13.

Week 14 included the instrumentation of the post-tests. That is, aviation-related vocabulary knowledge, English speaking anxiety level, and willingness to communicate in L2 level of student pilots were determined at the end of simulation-based training program.

3.7.2 Qualitative data collection procedures. The qualitative data collection procedure was as follows.

The main qualitative data collection instrument in the present study was the semi-structured focus-group interview, it was conducted at the end of the semester on Week 14. Participants in the interview were volunteers who stated their willingness at the end of the quantitative data collection process. All volunteers were informed about the data and location of the interview and were invited to attend. Among all invitees, five student pilots showed up and thus, the focus group consisted of these five student pilots. In order to get their true perceptions on the simulation-based training, the interview was conducted outside the classroom. The researcher and the focus group met at a coffee shop after the last session of the semester so that they would feel comfortable during the interview. Before the start of the interview, the researcher informed the participants about the semi-structured interview protocol and asked their consent. The interview was audio-recorded by the researcher so that a thorough analysis of the participants' responses to the questions could be made.

The secondary qualitative data collection instrument was substantive field notes. This procedure of keeping substantive field notes included the researcher's reflections regarding each session. Since the simulation-based training was a new and unique phenomenon both for the students and for the researcher, keeping field notes was a great opportunity for the researcher to raise personal awareness on how the course was progressing each week. In addition, this set of qualitative data made a significant

contribution to the research by providing a different perspective on this innovative ESP teaching setting.

3.8 Data Analysis Procedures

The mixed methods sequential explanatory research design required the collection of data in two consecutive phases: first the quantitative data, then qualitative data. The data analysis procedure was completed in the same order. That is, the researcher first completed the analysis of the quantitative data and then the qualitative data. A detailed description of each data analysis procedure is provided below.

3.8.1 Quantitative data analysis procedures. This procedure was completed in the following order: analysis of data regarding the English-speaking anxiety, willingness to communicate, vocabulary knowledge, and readback performance, respectively.

Participants' responses to the items in the English speaking anxiety scale were analyzed using the SPSS software version 25. The reason for collecting data regarding the English speaking anxiety was to determine if the simulation-based training had any influence on the level of student pilots' English speaking anxiety. Therefore, the data were collected at the beginning and end of the semester. Based on these two sets of quantitative data collected from the same cohort of participants, the researcher conducted normality tests to determine if the data were fit for parametric tests. The results of these preliminary tests showed that the data distributed normally and thus, the parametric test was conducted with this set of data.

Also, participants' responses to the items in the Willingness to Communicate scale were analyzed by utilizing the SPSS software version 25. The reason for collecting data regarding the willingness to communicate in English was to determine if the simulation-based training had any influence on the level of student pilots' willingness to communicate inside and outside the classroom. Therefore, the data were collected at the beginning and end of the semester. Based on these two sets of quantitative data collected from the same cohort of participants, the researcher conducted normality tests to determine if the data were fit for parametric tests. The results of these preliminary tests showed that the data distributed normally and thus, the parametric test was conducted with this set of data.

Another quantitative data analysis was related to participants' scores on the vocabulary knowledge test. The data were analyzed on the SPSS software version 25. The reason for collecting data regarding the aviation-related vocabulary knowledge was to determine if the simulation-based training had any influence on the vocabulary acquisition of student pilots. Therefore, the vocabulary knowledge tests were conducted before and after the implementation of the simulation-based pilotage training course. These two tests provided two separate scores for each participant enrolled in the course. First, this data set was tested to determine if it fitted for parametric tests. The results of these preliminary tests showed that the data was normally distributed and thus, the parametric tests were conducted with this set of data.

Also, the students' performance on the readback performance tasks was assessed by the researcher and a licensed ICAO rater in accordance with the ICAO English Language Proficiency Requirements (LPRs). This assessment was made based on a rubric developed by the researcher particularly for this research purpose (Figure 9). Moskal and Leydens (2000) highlighted the significance of validity and reliability when developing a scoring rubric and suggested that any rubric must include three types of evidence, namely content-related evidence, construct-related evidence, and criterion-related evidence. All these issues were considered in the present study.

To begin with, the level to which a student's responses to a certain assessment tool reflect that student's understanding of the relevant content area is referred to as content-related evidence, and the content of each readback performance task was in line with the topic of the respective week, thus the assessment rubric would truly identify if the students had developed the required knowledge and skill regarding the learning outcomes. Second, if the components of the responses being reviewed are adequate indicators of the underlying construct, that is what the construct-related evidence is worried about. Therefore, the rubric in this study was developed in line with the ICAO LPRs so that the students' performance would be assessed against pre-existing norms in the target work setting and truly indicated the underlying construct of readback performance. Finally, the criterion-related evidence backs up how closely an assessment's findings correspond to a present or upcoming event. In this sense, the rubric developed for this research study explicitly assessed the learners' performance on the readback procedure and thus, the findings of this assessment could truly represent a real-life task for the learners' prospective profession in the aviation

industry. As a result, the readback performance assessment rubric consisted of the following criteria: pronunciation, fluency, and comprehension.

Readback Performance Assessment Rubric					
Student Callsign:		Task Number:		Total Score:	GD
Level/Skill	Pronunciation		Fluency	Comprehension	ND
Level 6 Expert	Pronunciation, stress, rhythm, and intonation though possibly influenced by the first language or regional variation, almost never interfere with ease of understanding.	3	Able to speak at length with a natural, effortless flow. Varies speech flow for stylistic effect, e.g. to emphasize a point. Uses appropriate discourse markers and connectors spontaneously.	3	4
Level 5 Extended	Pronunciation, stress, rhythm, and intonation though influenced by the first language or regional variation, rarely interfere with ease of understanding.	2,5	Able to speak at length with relative ease on familiar topics but may not vary speech flow as a stylistic device. Can make use of appropriate discourse markers or connectors.	2,5	3
Level 4 Operational	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation but only sometimes interfere with ease of understanding.	2	Produces stretches of language at an appropriate tempo. There may be occasional loss of fluency on transition from rehearsed or formulaic speech to spontaneous interaction, but this does not prevent effective communication. Can make limited use of discourse markers or connectors. Fillers are not distracting.	2	2
Level 3 Pre-operational	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation and frequently interfere with ease of understanding.	1,5	Produces stretches of language but phrasing and pausing are often inappropriate. Hesitations or slowness in language processing may prevent effective communication. Fillers are sometimes distracting.	1,5	1
Level 2 Elementary	Pronunciation, stress, rhythm, and intonation are heavily influenced by the first language or regional variation and usually interfere with ease of understanding.	1	Can produce very short, isolated, memorized, utterances with frequent pausing and a distracting use of fillers to search for expressions and to articulate less familiar words.	1	0,5
Level 1 Pre-elementary	Performs at a level below the Elementary level	0	Performs at a level below the Elementary level	0	0

Figure 9. Readback performance assessment rubric.

3.8.2 Qualitative data analysis procedures. The second phase of the present study included the collection and analysis of the qualitative data which consisted of semi-structured interviews and field notes.

Throughout the qualitative data analysis, the researcher and an independent coder who was an expert in Aviation English teaching and data analysis, engaged in the parallel coding process as suggested by Thomas (2006). That is, two coders independently developed distinct sets of initial codes derived from the original data while following the same procedure. Then, the categories were negotiated after comparing various sets of codes. Finally, during the debriefing with the same inter-coder, the findings were discussed, and the final themes were shaped. This procedure ensured the inter-coder reliability in the qualitative data analysis process.

With regard to the analysis of both qualitative data sets, qualitative content analysis method was adopted. It includes the identification of thematic patterns in a qualitative dataset (Neuendorf & Kumar, 2016). It consists of three phases, namely

preparation, organizing, and reporting (Elo & Kyngäs, 2008, p. 110) (Figure 8). These processes were followed in the present study. Accordingly, the analysis started with the researcher transcribing a total of 45-minute-long interview data. Then, the transcribed data were iteratively coded by instrumenting open, axial, and selective coding techniques (Boeije, 2010; Flick, 2009). This enabled the researcher to identify and group the commonalities in responses. Next, thematic patterns among the emerging codes were sought, which led to the emergence of final themes regarding the student pilots' attitudes toward simulation-based training in the aviation context.

<i>Preparation</i>
Being immersed in the data and obtaining the sense of whole, selecting the unit of analysis, deciding on the analysis of manifest content or latent content.
<i>Organising</i>
Open coding and creating categories, grouping codes under higher order headings, formulating a general description of the research topic through generating categories and subcategories as abstracting.
<i>Reporting</i>
Reporting the analysing process and the results through models, conceptual systems, conceptual map or categories, and a story line.

Figure 10. Qualitative content analysis phases (Elo & Kyngäs, 2008, p. 110)

3.9 Validity and Reliability in Quantitative Research

In any quantitative research, reliability and validity are paramount considerations. In the present study, guidelines to ensure the validity of the tools instrumented and the reliability of results were strictly followed.

3.9.1 Validity in quantitative research. Validity relates to veracity, demonstrating how well it corresponds to actual reality, whereas reliability refers to the consistency or dependability of an instrument, including stability, internal consistency, and equivalence (Neuman, 2014). In quantitative research, content, construct, internal, and external validity are the most frequently addressed varieties of validity (Cohen et al., 2007). Content and construct validity in this current research were basically maintained by the use of the English-speaking Anxiety Scale (Demirdöken & Okur, 2023) and the Willingness to Communicate Scale (Uyanık, 2018) both of which were developed to be instrumented in similar contexts to the present study's context. Also, both instruments were reported to accurately measure

the constructs they were supposed to. Regarding the internal and external validity, on the flipside, the present research was conducted in a context that represented the equivalent characteristics of ESP programs focusing on aviation in Turkish setting, with a comparable student population, participants with similar backgrounds, valid research instruments, and time periods that were representative of typical ESP teaching practices. Also, the measurements or items used to evaluate the constructs in this study were consistent and dependable. That is, various items or indicators designed to measure the same construct can produce consistent results. Therefore, the findings of this study can be applied to other situations, groups, or events.

3.9.2 Reliability in quantitative research. Reliability is a crucial concern in order to reduce errors during the analysis of responses to research instruments (Creswell, 2012). In educational contexts, reliability refers to the internal consistency of a test, which is typically measured by the Cronbach alpha value, also known as the alpha coefficient (Cronbach, 1951).

In the present study, quantitative data were gathered using a variety of Likert-type scales. In order to determine the reliability of these instruments, the reliability tests were performed for both English Speaking Anxiety Scale (ESA) and Willingness to Communicate Scale (WTC), and the Cronbach alpha score was calculated 0.81 for ESA and 0.84 for the WTC (Table 8). According to Nunnally and Bernstein (1994), the Cronbach alpha value of 0.70 is the minimum value for a research instrument to be reliable. Therefore, it can be concluded that both scales instrumented in this study were reliable research instruments.

Table 8
Reliability Tests for ESA and WTC Scales

	Number of items	Cronbach's Alpha
English Speaking Anxiety Scale	16	.810
Willingness to Communicate Scale	25	.846

As for the reliability of the vocabulary knowledge test, the item difficulty analysis was performed. Item analysis investigates student responses to individual test items, multiple choice questions (MCQs), in order to evaluate the quality of the items and the test as a whole in order to improve/revise the items and the test (Singh et al.,

2009). An effective item that can evaluate cognitive, affective, and psychomotor domains is favored over other methods, and the item analysis permits the identification of quality multiple choice questions based on the difficulty index (DIF I) and the discrimination index (DI) (Garg et al., 2018).

A P value represents the difficulty index (DIF I). DIF I is a misnomer, since the greater the value of DIF I, the simpler the item, and vice versa (Mehta et al., 2016). Osterlind (2002) states that the item difficulty index should be between 0.40 and 0.80 for achievement tests. On the other hand, the multiple choice questions are argued to be good if the DIF I is between 0.30 and 0.80 in social sciences since these are classified as moderately difficult (Azzopardi & Azzopardi, 2019). Also, it is argued that any question that has a DIF I index of lower than 0.3, which are classified as too hard, or higher than 0.8, which are classified as too easy, should be modified (Azzopardi & Azzopardi, 2019). All multiple choice questions in the vocabulary knowledge test of the present study were found to fit this criterion and to be moderately difficult (Table 9).

Table 9
Item difficulty Indices

Multiple choice questions	Item difficulty index	Classification of difficulty level
Question 1	0,47	Moderate
Question 2	0,42	Moderate
Question 3	0,71	Moderate
Question 4	0,47	Moderate
Question 5	0,33	Moderate
Question 6	0,71	Moderate
Question 7	0,57	Moderate
Question 8	0,33	Moderate
Question 9	0,66	Moderate
Question 10	0,33	Moderate
Question 11	0,42	Moderate
Question 12	0,80	Moderate
Question 13	0,38	Moderate
Question 14	0,42	Moderate
Question 15	0,33	Moderate
Question 16	0,52	Moderate
Question 17	0,33	Moderate
Question 18	0,61	Moderate
Question 19	0,52	Moderate
Question 20	0,66	Moderate

With regard to the discrimination index of the items in the test, the analysis (Table 10) showed that half of the multiple choice questions were categorized as excellent whereas the remaining half of the questions were good (Garg et al., 2018). In addition, Kuder-Richardson 20 (KR-20) analysis of variance is a frequently employed technique for estimating internal consistency reliability (Bademci, 2011). Therefore, KR-20 test was run to test the internal consistency reliability of the vocabulary knowledge test. Nunnally (1978) argued that the internal reliability coefficient value should be higher than 0.7. In the present study, this value of the instrument was calculated as .72 and thus, this instrument was found to have internal consistency reliability.

Table 10

Item Discrimination Analysis

Multiple choice questions	Item discrimination index	Classification of discrimination index
Question 1	0,17	Good
Question 2	0,50	Excellent
Question 3	0,33	Excellent
Question 4	0,50	Excellent
Question 5	0,17	Good
Question 6	0,17	Good
Question 7	0,17	Good
Question 8	0,33	Excellent
Question 9	0,50	Excellent
Question 10	0,67	Excellent
Question 11	0,33	Excellent
Question 12	0,17	Good
Question 13	0,33	Excellent
Question 14	0,33	Excellent
Question 15	0,17	Good
Question 16	0,67	Excellent
Question 17	0,17	Good
Question 18	0,17	Good
Question 19	0,17	Good
Question 20	0,17	Good

Readback Performance Assessment Rubric was the last research instrument for which reliability was tested. To do so, the intraclass correlation coefficient (ICC) which is “a widely used reliability index in test-retest, intra-rater, and inter-rater reliability analyses reflecting both the degree of correlation and agreement between

measurements of continuous data” (Koo & Li, 2016, p. 1) was calculated. The purpose here was to determine if the scoring of two independent raters correlated for a reliable interpretation of the student pilots’ pronunciation, fluency, and comprehension skills on the readback performance tasks. The result of the reliability test yielded the intraclass correlation coefficient of .981 (Table 11), which was considered as excellent by Koo and Li (2016).

Table 11

Inter-rater Reliability Scores

	Intraclass Correlation	95% Confidence Interval		F Test with True Value			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	,963	,951	,972	52,994	209	209	,000
Average Measures	,981	,975	,986	52,994	209	209	,000

3.10 Trustworthiness in Qualitative Research

Trustworthiness is a significant consideration in any qualitative research. According to Lincoln and Guba (1985) the four most well-known essential components of trustworthiness that qualitative research must establish are credibility, transferability, dependability, and confirmability.

Credibility can be ensured by using several methods including prolonged engagement, persistent observation, data collection triangulation, researcher triangulation, peer debriefing, and member checking. In the present study, it was operationalized in several ways in the present study. First, in terms of long-term engagement, the researcher had a decent teaching background in the context with the same cohort of participants. In addition, since the researcher was an experienced ESP instructor in the aviation context, he had a thorough awareness of the participants' and the institution's characteristics. Furthermore, a variety of data collecting modalities, including semi-structured interview and field notes were instrumented "to obtain different but complementary data" (Morce, 1991, p. 122). The use of two independent

coders for analyzing and interpreting the data ensured credibility. In a similar vein, member checking (Birt et al., 2016), which is defined as "the process of continuous, informal testing of information by soliciting reactions of respondents to the investigator's reconstruction of what he or she has been told or otherwise found out" (Schwandt et al., 2007, p. 19), was carried out after data collection to test the findings and interpretations with the participants. Peer debriefing also provided a third-party check for the researcher on the study process, determining whether the conclusions were reasonable, the themes were suitable, and the findings were found in the data (Jeanfreau & Jack, 2010). Transferability relates to the generalizability of an investigation and can be done by providing detailed descriptions of the findings so that they can be transmitted to the sites of the researchers who seek them (Lincoln & Guba, 1985). In this study, not only were the experiences and behaviors reported in depth, but also the context, such that they were meaningful to outsiders, other researchers, and practitioners in similar EFL environments who wanted to duplicate the study.

Regarding dependability, the research procedure was logical and well-documented, as suggested by Tobin and Begley (2004). Audit trail (Koch, 1994) is a method for obtaining dependability and is utilized for describing the research steps openly and reporting the findings. To demonstrate the dependability of this study, all relevant information regarding participant characteristics, research location, data collection instruments, and data analysis procedures was provided in depth. Throughout the study, recordings of the research path were also maintained. By keeping raw data records, field notes, and transcripts, the researcher in this study sought not only to systematize and cross-reference data, but also to simplify the reporting of the research process in order to create a clear audit trail.

Confirmability relates to the objectivity of the research (Patton, 2002), and its purpose is to demonstrate that the researcher's conclusions and interpretations are derived clearly from the data (Tobin & Begley, 2004). It could only be attained after establishing credibility, transferability, and dependability (Guba & Lincoln, 1989). As Koch (1994) indicated, by providing justifications for theoretical, methodological, and analytic choices throughout the entire study, the researcher in this study aimed to help others better comprehend how and why decisions were made. The researcher used triangulation based on the collection of multiple data sets (Creswell, 2012) and substantive field notes to eliminate biases and presuppositions in order to assure objectivity.

3.11 Limitations

The present study has some limitations. Primarily, the participants in this study were limited to 21 student pilots. Although this was the highest number of participants who met the selection criteria described in previous headings, the recruitment of more than 21 participants can be considered in a more comprehensive study. Second, all these participants made up the intervention group. That is, none of the participants were placed in the control group in accordance with the purposes of and due to the nature of the study. Therefore, a similar study with a control group can be designed to determine the difference between the two groups. The third limitation of this study was related to the integration of simulation into the ESP teaching setting, which required varying amounts of time for each student to get familiar with the Microsoft Flight Simulator version 2020. That is why the attainment of the learning outcomes might have been influenced by the degree of familiarity with the software. Similarly, the fourth limitation was related to the integration of flying hardware for instructional purposes. Since the simulation sessions throughout the course required students to fly an aircraft by means of some control devices including a yoke and a throttle as well as a headset for communication, the students needed some time to feel comfortable using these devices.

Chapter 4

Findings

This section presents findings regarding quantitative and qualitative data, respectively. In this sense, the first main title presents the findings pertaining to the English speaking anxiety, willingness to communicate in L2, vocabulary development, and readback performance. Then, findings pertaining to the teacher's field notes and the interviews are provided in the the second main title of this section.

4.1 Quantitative Data Results

This title starts with the presentation of data analysis results regarding the English speaking anxiety. It is followed by willingness to communicate and vocabulary development. Finally, the results for the readback performance tasks are provided under this title.

4.1.1 Findings pertaining to English speaking anxiety. The analysis of responses to the English Speaking Anxiety Scale first included tests of normality. The results of Shapiro-Wilk and Kolmogorov-Smirnov tests as well as Skewness and Kurtosis values and Q-plots help researchers to test the normality assumption. It is argued that, for samples under 50, the Shapiro-Wilk test is a better option (Mishra et al., 2019). The results of Shapiro-Wilk test showed that the data were collected from normal distributed population (Table 12). Therefore, further normality tests were run to test if the dataset met the requirements of other normality tests as well.

Table 12

Kolmogorov-Smirnov and Shapiro-Wilk Test Scores for ESA Scale

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
ESA Pre-test	,156	21	.198	,943	21	.246
ESA Post-test	,134	21	.200	,972	21	.785

Skewness is a measure of symmetry, or more accurately, the normal distribution's lack of symmetry, and kurtosis is a measure of how peaked a distribution is. Tabachnik and Fidell (2007) suggest that the acceptability of skewness and kurtosis values is between the range of -2 to +2. Accordingly, these values fit into this description of normal distribution (Table 13).

Table 13

Skewness and Kurtosis Values for The ESA Scale

	Skewness	Std. Error	Kurtosis	Std. Error
ESA Pre-test	-,738	,501	,316	,972
ESA Post-test	,025	,501	,722	,972

Parametric tests, therefore, appeared as the appropriate statistical test for this variable, and a paired samples t-test was run to determine if the simulation sessions had any influence on the English speaking anxiety levels of participants.

The results showed that there was a statistically significant difference between the English speaking anxiety pre-test ($\bar{X} = 60,67$, $\sigma = 3,582$) and English speaking anxiety post-test ($\bar{X} = 38,19$, $\sigma = 2,960$) scores, and the English speaking anxiety of student pilots after the simulation sessions was significantly lower than their English speaking anxiety before the simulation sessions ($t(20) = 20,176$, $p = .000$) (Table 14).

Table 14

Paired Samples T-test on the English-speaking Anxiety

	Paired Differences						t	df	Sig. (2-tailed)
	Mean	Std. Dev.	Std. Error	95% Confidence Interval of the Difference					
				Lower	Upper				
ESA pre vs. post-test scores	22,476	5,105	1,114	20,152	24,800	20,176	20	,000	

4.1.2 Findings pertaining to willingness to communicate. The analysis of responses to the Willingness to Communicate Scale first included tests of normality. The results of the Shapiro-Wilk test initially signaled a normally distributed population (Table 15).

Table 15

Kolmogorov-Smirnov and Shapiro-Wilk Test Scores for WTC Scale

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
ESA Pre-test	,159	21	.176	,961	21	.541
ESA Post-test	,137	21	.200	,950	21	.344

Also, the WTC dataset was found to match Tabachnik and Fidell's (2007) acceptability values for skewedness and peakedness (Table 16).

Table 16

Skewness and Kurtosis Values for WTC Scale

	Skewness	Std. Error	Kurtosis	Std. Error
WTC Pre-test	,272	,501	,042	,972
WTC Post-test	,738	,501	,231	,972

As a result, parametric tests appeared as the appropriate statistical test for this variable. The descriptive statistics regarding the WTC showed that the mean of total score on the willingness to communicate pre-test was 134,38 ($\sigma = 23,642$) whereas the mean of total score on the willingness to communicate post-test was 164,14 ($\sigma = 9,504$) (Table 17).

Table 17

Descriptive Statistics for WTC Scale

	N	Mean	Std. Deviation	Min	Max
Pre-test Total Score	21	134,38	23,642	85	180
Post-test Total Score	21	164,14	9,504	149	186

A paired samples t-test was run to find out how the simulation sessions influenced the student pilots' overall willingness to communicate in L2. The results showed that there was a statistically significant difference between the willingness to communicate in L2 pre-test ($\bar{X} = 134,38$, $\sigma = 23,642$) and willingness to communicate in L2 post-test ($\bar{X} = 164,14$ ($\sigma = 9,504$) scores, and the willingness to communicate in L2 levels of student pilots after the simulation sessions were significantly higher than their willingness to communicate in L2 before the simulation sessions ($t(20) = -8,385$, $p = .000$) (Table 18).

Table 18

Paired Samples T-test on the Willingness to Communicate

	Paired Differences						Sig. (2-tailed)	
	95% Conf. Int. of the Diff.							
	Mean	Std. Dev.	Std. Error	Lower	Upper	t		df
WTC in L2 pre vs. post-test scores	-29,76	16,26	3,550	-37,16	-22,35	-8,385	20	,000

According to the score ranges provided in the instrumented WTC scale (Uyanık, 2018) (Table 19), it was also concluded that student pilots had a moderate level of willingness to communicate in L2 at the beginning of the study whereas they were found to develop a high level of willingness to communicate in L2 by the end of the semester. In addition, the mean score on the WTC pre-test was 134,38 whereas the same score was calculated as 164,14 on the WTC post-test, which showed a difference of 29,76 points between the two measurements.

Table 19

Score Ranges in the WTC Scale

Scoring Option	Score Limit
Very low	0 – 50
Low	51 – 100
Moderate	101 – 150
High	151 – 200
Very high	201 – 250

4.1.3 Findings pertaining to vocabulary development. The third variable tested in the present study was vocabulary development. The student pilots were given the vocabulary knowledge test at the beginning and at the end of the semester to determine if the simulation sessions had any statistically significant difference in the overall vocabulary knowledge with regard to the aviation context. Therefore, participants' scores on the pre- and post-vocabulary knowledge tests were analyzed. A statistic called the Kuder-Richardson formula measures how well a set of test items can be seen as measuring a single latent variable, which is a variable that cannot be seen directly from the outside. That is, it shows the degree to which various measures are effectively measuring the same thing. The results of the KR-20 test, which was provided in the reliability and validity title of the present study, had shown that the vocabulary knowledge test was an accurate tool to determine the vocabulary knowledge of the student pilots. In addition, tests of normality were also run to determine if the data are drawn from a normally distributed population. According to Tabachnik and Fidell (2007) skewness and kurtosis values are acceptable when they are between - / + 2. In this study, these values were found to be in line with the suggestion of Tabachnik and Fidell (2007) (Table 20).

Table 20

Skewness and Kurtosis Values of The Vocabulary Knowledge Test

	Skewness	Std. Error	Kurtosis	Std. Error
Vocabulary knowledge pre-test	-,218	.501	-,448	.972
Vocabulary knowledge post-test	,066	.501	-1,190	.972

Additionally, Mishra and others (2019) recommended considering the Shapiro-Wilk normality test results when determining the degree of normality for small samples (50 participants). The results of this test showed a normal distribution (Table 21).

Table 21

Kolmogorov-Smirnov and Shapiro-Wilk Test Scores for Vocabulary Knowledge Test

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Vocabulary knowledge pre-test	,129	21	,200	,973	21	,800
Vocabulary knowledge post-test	,156	21	,200	,936	21	,184

Finally, the Q-Q plots (Figure 11) were looked at, and it was found that the pre- and post-tests of vocabulary knowledge again met the normality assumption.

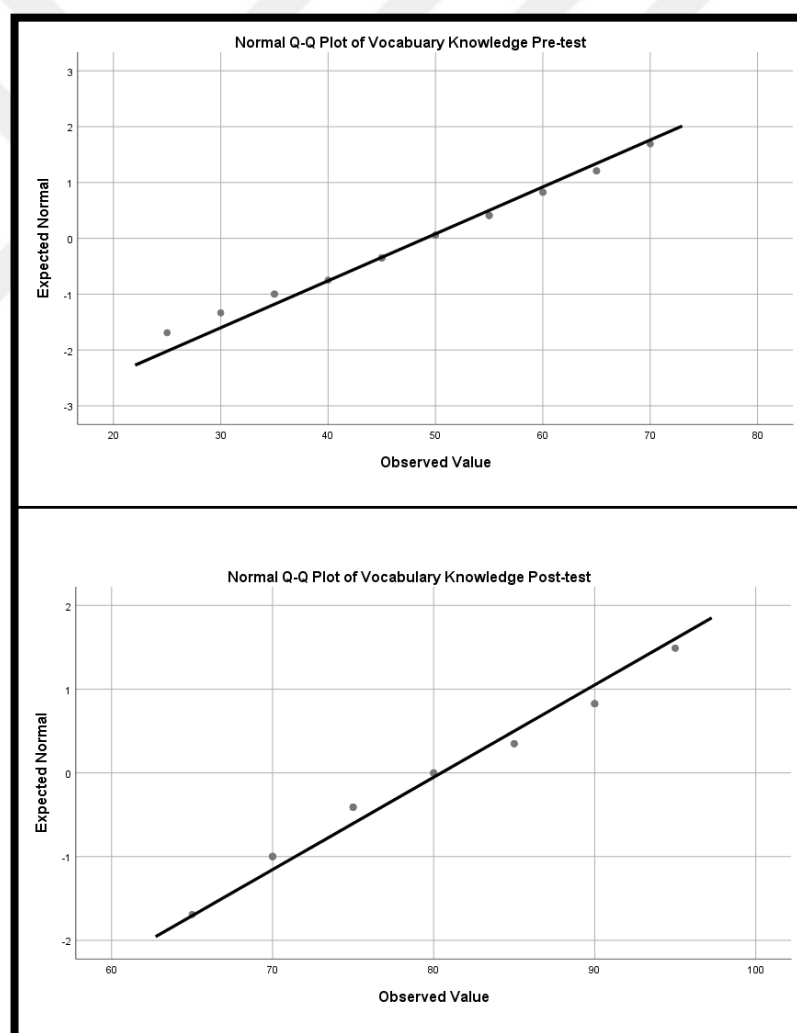


Figure 11. Q-Q Plots of Vocabulary Knowledge Pre- and Post-tests.

So, parametric tests appeared as the right statistical test. To find out how the simulation sessions affected the student pilots' overall vocabulary knowledge, a paired samples t-test was used. The results showed that there was a statistically significant difference between the vocabulary knowledge pre-test ($\bar{X} = 49,05$, $\sigma = 11,897$) and post-test ($\bar{X} = 80,48$ ($\sigma = 9,070$) scores, and the vocabulary knowledge of student pilots after the simulation sessions was significantly higher than their vocabulary knowledge before the simulation sessions ($t(20) = -36.752$, $p = .000$) (Table 22).

Table 22

Paired Samples T-test on the Vocabulary Knowledge

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Dev.	Std. Error	95% Confidence Interval of the Difference				
				Lower	Upper			
Vocabulary Knowledge Pre vs. Post-test Scores	-31,429	3,919	,855	-33,21	-29,64	-36,75	20	,000

4.1.4 Findings pertaining to readback performance. The last quantitative data analysis yielded results regarding the readback performance of student pilots.

Student pilots' scores on the readback performance tasks were analyzed to find out if simulation sessions had any influence on the overall readback performance of learners. In this regard, the researcher first explored the descriptive statistics. Second, normality tests were run to determine if the data set met assumptions for parametric tests.

Table 23 shows that the lowest mean score was observed in Task 6, for which the average of raters' scoring was calculated as 6,88. Contrastively, the highest score was observed in Task 5, for which the average of raters' scoring was calculated as 9,30. Therefore, it was concluded that student pilots' readback performance on Taks 5 was the best whereas their performance on Task 6 was the worst in terms of pronunciation, fluency, and comprehension. Also, it was inferred that there was at least one student who received 10 out of 10 in all tasks except Task 10, in which the highest

score given by the raters was 9,50 out of 10. Finally, the average of raters' scoring was found to be the lowest in Task 3 and Task 4 with an average score of 4,25. However, the minimum score given by the raters was the highest in Task 1 with a minimum score of 7,25, which showed that student pilots' performance varied the least in Task 1 compared to other tasks. On the other hand, the variation in the readback performance was observed to be the highest in Task 3 and Task 4.

Table 23

Descriptive Statistics of Raters' Average Scoring On Each Task

Task	N	Mean	Median	Mode	Minimum	Maximum
Task 1	21	9,19	9,50	9,50	7,25	10,00
Task 2	21	8,65	8,25	10,00	7,00	10,00
Task 3	21	8,38	9,75	10,00	4,25	10,00
Task 4	21	8,16	9,00	10,00	4,25	10,00
Task 5	21	9,30	9,75	10,00	7,50	10,00
Task 6	21	6,88	6,75	5,75	4,75	10,00
Task 7	21	8,50	8,75	8,25	6,25	10,00
Task 8	21	7,90	7,75	7,75	4,75	10,00
Task 9	21	8,17	8,25	10,00	5,75	10,00
Task 10	21	7,76	7,75	7,75	4,75	9,50

Table 24 shows that the mean scoring of Rater 1 on *pronunciation* was 2,54 whereas it was 2,59 for Rater 2; the mean scoring of Rater 1 on *fluency* was 2,65 whereas it was 2,63 for Rater 2; the mean scoring of Rater 1 on *comprehension* was 3,06 whereas it was 3,08 for Rater 2; the mean of Rater 1's total scoring was 8,26 whereas it was 8,31 for Rater 2; the average of raters' total scores was 8,29. It was also concluded that the mean scoring of Rater 1 (2,65) was higher than Rater 2 (2,63) only in the assessment of *fluency*. On the other hand, Rater 2 was found to have scored the

students higher on average than Rater 1 in the assessment of *pronunciation* (Rater 2: 2,59; Rater 1: 2,54) and *comprehension* (Rater 2: 3,08; Rater 1: 3,06). With regard to their overall assessment of student pilots' readback performance, Rater 2 (8,31) was the higher-scoring person compared to Rater 1 (8,29) with a deviation of 0,02 points.

Table 24

Descriptive Statistics of Raters' Scorings

	N	Mean	Median	Mode	Minimum	Maximum
Pronunciation Rater 1	210	2,54	2,50	2,50	1,00	3,00
Pronunciation Rater 2	210	2,59	2,50	2,50	1,00	3,00
Fluency Rater 1	210	2,65	3,00	3,00	1,00	3,00
Fluency Rater 2	210	2,63	2,50	3,00	1,50	3,00
Comprehension Rater 1	210	3,06	4,00	4,00	1,00	4,00
Comprehension Rater 2	210	3,08	4,00	4,00	1,00	4,00
Total Score Rater 1	210	8,26	8,50	10,00	4,00	10,00
Total Score Rater 2	210	8,31	8,50	10,00	4,00	10,00
Average of Total Score	210	8,29	8,75	10,00	4,25	10,00

The findings of the normality tests showed that the data was fit for parametric tests. According to Tabachnik and Fidell (2007) skewness and kurtosis values are acceptable when they are between - / + 2. On similar grounds, the skewness was calculated as -.281 whereas the kurtosis was found to be -.902 (Table 25), both of which were acceptable values for normality assumption.

Table 25

Skewness and Kurtosis Values of the Total Scores

	Skewness	Std. Error	Kurtosis	Std. Error
Students' total scores on all readback performance tasks	-,281	.501	-,902	.972

In addition, the Shapiro-Wilk test value is suggested for assessing the appropriateness of the data to conduct parametric tests (Mishra et al., 2019). The results of this test showed normality assumption was met (Table 26). Finally, the Q-Q plots (Figure 12) were analyzed, and it was concluded that parametric tests could be conducted to see the influence of readback performance tasks on students' overall readback performance based on the industry standards published by the ICAO.

Table 26

Normality Tests for Total Scores On All Readback Performance Tasks

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Students' total scores on all readback performance tasks	,127	21	,200	,960	21	,509

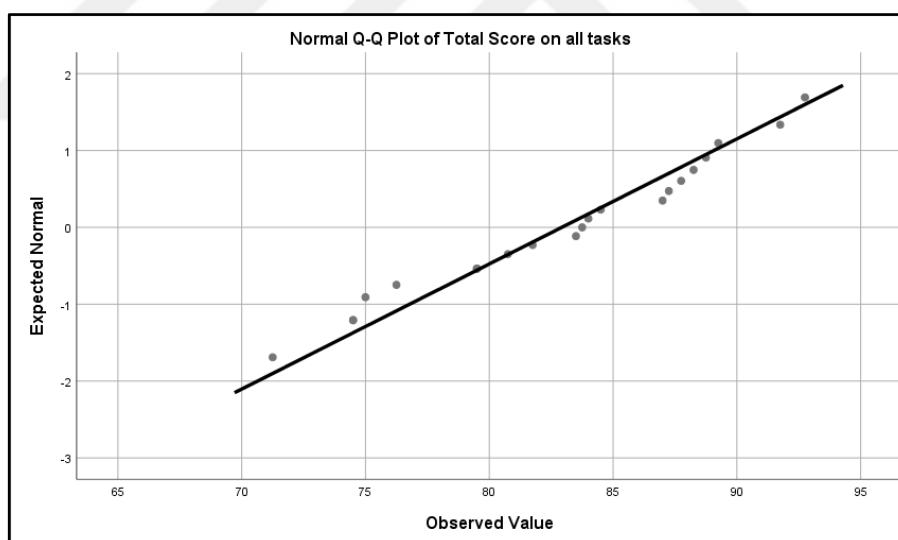


Figure 12. Q-Q Plots of Students' Total Scores on Readback Performance Tasks.

Having concluded that the data set met all normality assumptions, the researcher conducted one-sample T-test to determine if students' overall performance on all readback performance tasks met the industry standards. Since the ICAO level 4 is the minimum standards in aviation, a minimum of 60 points, which corresponded to this industry standard in the assessment rubric, was regarded as the reference value to test students' readback performance in terms of *fluency*, *pronunciation*, and

comprehension. The results of the one sample T-test (Table 27) showed a statistically significant difference between students' total scores on all readback performance tasks ($\bar{X} = 82,92$, $\sigma = 6,144$) and the ICAO level 4 standards (the minimum score of 60 according to the rubric), and the students' total scores on the readback performance tasks were significantly higher than the ICAO level 4 standards at the end of the course ($t(20) = 17,100$, $p = .000$). Therefore, it was concluded that the readback performance tasks were helpful for student pilots in meeting the ICAO language proficiency requirements in the aforementioned language skills.

Table 27

One-sample T-test

Test value = 60						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Readback Performance Total Scores	17,100	20	0,000	22,92	20,13	25,72

4.2 Findings Pertaining to Qualitative Data Analysis

This title starts with the presentation of results regarding the field notes taken by the researcher. It is followed by the findings of the interview data.

4.2.1 Findings pertaining to field notes. The data regarding the field notes were kept by the teacher, who was the researcher of the present study at the same time, for the purpose of developing a better understanding of the implementation of the simulation-based aviation English course. The qualitative content analysis of the field notes yielded two major themes, namely *instructional drawbacks* and *attainments of students*, respectively. This subheading presents the findings of each theme in detail.

4.2.1.1 Theme 1 Instructional drawbacks. The first theme identified in the qualitative content analysis of the field notes was associated with five major areas of challenges reported by the researcher, which were also the five categories emerging from thirteen codes. These challenges were the drawbacks of simulation-based training in the context of aviation.

The first drawback was related to the high number of students enrolled in the course and the technical infrastructure. The field notes showed that the instructor reported an issue with the audio output in Week 2, which impeded the comprehension of the ATIS (Automated Terminal Information System) message by the students. Similarly, the availability of only one simulator was noted by the instructor as a technical drawback of the course. Finally, the instructor reported that he “*was not happy with the learning setting in terms of size and availability of technology infrastructure and requested another classroom from the institution*” in the first week.

The second instructional drawback reported by the instructor was the challenge originating from the context in which the study was conducted. The notes taken by the researcher was as follows: “*...they (referring to the students) don’t have the opportunity to practice speaking to air traffic controllers*” and “*they (again referring to the students) complained about some pilots and air traffic controllers who tend to speak Turkish over the radio, which impeded their learning and performance.*” In short, the tendency of some pilots to switch from English into Turkish when communicating with the air traffic controllers decreased the opportunity for learners to expose themselves to authentic listening materials in the Turkish context where English is not the common means of communication outside the classroom.

The third drawback highlighted in the field notes was associated with the challenges perceived and reported by the learners themselves. These were particularly related to the anxiety to speak English, fear of making mistake, and learners’ lack of vocabulary knowledge. The field notes pertaining to the language proficiency and speaking anxiety were, for instance, noted by the researcher as early as Week 1 whereas the learners’ fear of making mistake in front of their friends was reported in Week 3 with the following words: “*Some students explicitly stated that they were afraid of making a mistake while flying the aircraft.*”

Another instructional drawback was based on the researcher’s observations concluding that there was a reluctance to “*...take part in the simulated flights. What is more, those who attended the simulation sessions were mostly the ones that were*

encouraged by other students.” Also, the instructor observed and noted in Week 3: “*...students reported that flying the aircraft and communicating with the ATC is quite challenging, which can be attributed to the cognitive load of students. Their performance might be influenced negatively by the limited capacity of their working memory.*” This was further detailed in the following week: “It has also been observed that students are particularly more challenged in the (short) final approach phase. This can be associated with the mentally demanding phase of the flight during which pilots need to stabilize the aircraft as well as fully establish it for the landing.” These observations made up the fourth instructional drawback of the simulation-based pilotage course.

The last drawback reported by the instructor was related to the simulation software. The notes from Week 1 showed that “*...students did not have any idea about the use of simulation technology for educational purposes.*” Therefore, the instructor noted the following week “*after each lesson, if possible, additional simulation sessions can be held for students so that they will get used to the simulator as early as possible*” because it was only until Week 4 that the instructor reported “*Week 4 is by far the most stable week in terms of simulation integration.*” This was followed by an unexpected situation in the course that “*the students are now (referring to Week 4) fully capable of performing their duties easily. Therefore, the orientation to the new learning environment lasted longer than expected.*” Overall, these five areas of challenges constituted the ground for the first theme emerging from the qualitative content analysis of the field notes. The following subheading describes the second theme.

4.2.1.2 Theme 2 Attainments of students. The second theme identified in the qualitative content analysis of the field notes was associated with positive outcomes noted by the instructor. This theme emerged from two categories, namely *engagement* and *contributions*, which were composed of eight codes.

The first attainment noted by the instructor was related to engagement. The traces of increased engagement were noted in several instances by the researcher. To illustrate, the eagerness to engage in the simulation session was reported in Week 7 as follows: “*All in all, the students who took part in the simulation session were very eager to fly. Besides, one of the students wanted to fly for the second time the same day.*” The willingness to engage in the simulation sessions was further associated by the researcher with the desire to develop pilotage skills based on the following field

note from the same week: “...*His reason was to develop his performance, which made me think that he really believes that simulation session can improve his performance.*” This was even more notable in the field note from Week 4: “*With regard to ATC communication, the students have been observed to be more engaged in the process when the ATC instruction is more challenging.*” These field notes showed that learners were highly engaged in the learning process, which was noted as one of the instructional attainments in this course.

Another attainment emerged from the qualitative content analysis of the field notes was the contribution of the simulation-based course for the learners in various ways. These contributions included performance improvement through simulation, increased self-confidence, and collaboration. The researcher had previously noted that student needed some time to familiarize themselves with the simulation software because they were having difficulty in maintaining the control of the aircraft and the ATC communication simultaneously. The students were reported to have overcome this difficulty over time according to the field notes from Week 5: “*Although students seemed to have difficulty in communication with the ATC during the climb procedure, they all got used to it and improved their performance.*” This observed improvement in learners were further noted by the researcher and associated with the self-confidence in the following excerpt: “*The most significant change in students was the overall self-confidence. They were clearly counting on themselves in terms of completing the pilotage tasks as well as communicating with the ATC. Therefore, it can be argued that simulation sessions might also contribute to the development of self-confidence.*” In brief, these areas of contributions were noted as the attainments of the course based on the qualitative content analysis of the field notes.

4.2.2 Findings pertaining to the interview. The second source of qualitative data was the focus-group interview. The findings pertaining to this data set were obtained by conducting qualitative content analysis which yielded fifty-six codes. These codes made up the fifteen categories which, finally, turned into four themes, namely *Occupational Outcomes*, *Communicative Competence*, *As Good as It Gets*, and *Simulation as the Cure for English-speaking Anxiety* (Table 28).

Table 28

Categories and Themes Explored in The Focus-Group Interview Data.

Categories	Themes
Knowledge gain	Occupational outcomes
Knowledge transfer	
Building awareness	
Alignment with the learners' prospective career	
Other learning gains	
Improved communication	Communicative competence
Variations in language use	
Improved vocabulary knowledge for effective communication	
Signs of the English speaking anxiety	Simulation as the cure for English speaking anxiety
Impressions on the contribution of simulation to decreased English speaking anxiety	
Learning gains associated with the English speaking anxiety	
Crowded setting	As good as it gets
Course design	
Suggestions for the readback performance tasks	
Suggestions for the simulation sessions	

4.2.2.1 Theme 1 Occupational outcomes. The first theme identified in the qualitative content analysis of the interview data was labeled as occupational outcomes. A total of eighteen codes were identified, which yielded five categories that made up this theme.

4.2.2.1.1 The alignment of the course outcomes with learners' prospective careers. The first category that was included in the theme of occupational outcomes was the alignment of the course outcomes with learners' prospective careers. That is, participants considered this course had direct contribution to the skills they need to be employed in the aviation industry. For instance, Interviewee 4 explicitly associated one of his attainments at the end of the course with an occupational requirement to

efficiently communicate on the radio with the air traffic controllers in the following excerpt:

ICAO had released a report on the cognitive load of the pilots during takeoff and landing. They were too occupied with controlling the aircraft and communicating with the air traffic controllers. For these reasons, it is important for student pilots to develop an understanding of these exchanges before they step in the cockpit. I am happy that I have it at the end of the course (Interviewee 4).

Along similar lines, Interviewee 1 stated that the course was beneficial for him because “...everything you learn during the flight simulation will be right in front of you in the cockpit. Therefore, it is practical since you use it already.” In addition, when participants were asked to reflect on the applicability of the outcomes of the course to their future career, Interviewee 5 reported that the learning outcomes were in line with his future career in the following statement: “When I go to the airfield and start my PPL, I will be overloaded with the tasks that I need to do at once. So, this prepares me psychologically, physically, every way. It is beneficial.” Accordingly, it was concluded that the learning outcomes of the simulation-based pilotage training course were aligned with the occupational requirements.

4.2.2.1.2 Knowledge gain. The second category was labeled as *knowledge gain*. During the focus group interview, the participants were asked to reflect on the ways, if any, they have improved themselves throughout the course. Interviewee 4 highlighted the knowledge gain in this course and commented “Although I knew, in theory, how to fly the aircraft, I learned how to do these two tasks simultaneously.” This was mentioned in another instance by another participant (Interviewee 3) who reported “I now know what to do and when to do. And that is extremely useful for me. I did not have this experience before starting my training.” Interviewee 2 further commented on the knowledge gain and said: “I also think that I learned the phases of a flight and so, I have learned how to pick the most appropriate word depending on the phase of the flight.” The participants’ reflections on the knowledge gain was not limited to these examples of developing procedural knowledge but extended to the

development of propositional knowledge. To illustrate, Interviewee 1 reported that he had improvement in terms of his propositional knowledge of the theory of flight, and he preferred the following words to describe it: *“I mean the tasks we were given actually improved our knowledge about what was going on in the air.”* These reflections showed that the simulation-based course aided the learners to gain knowledge regarding their profession.

4.2.2.1.3 Knowledge transfer. The third category was labeled as the *knowledge transfer*. This category included learners’ reflections on how they learned to apply the gained knowledge in the real work setting and how they familiarized themselves with the tasks in that setting. For instance, Interviewee 1 stated his contentedness when asked about his overall flight simulation experience during the semester, and stated:

For me Sir, it was good. It was kind of simulating the flight for real. The flights on the ground improve the communication part and getting familiar with all the procedures. It was kind of similar to flying a real aircraft. And actually, it all depends on the procedure, because if you know the procedure in the simulator you will do it in the real life (Interviewee 1).

Along similar lines with him, Interviewee 5 reported that learning new vocabulary through simulation was convenient since he was able to transfer what he learned into the target setting. Accordingly, he commented *“I must say I have learned a lot. For example, not “one zero degrees Celsius” or something like that but more like the phrases I did not know before. It is much more practical, and I believe it is a little like putting everything into practice.”* Building on this reflection, Interviewee 4 reported how he put the knowledge into practice when communicating with the air traffic controllers in the following excerpt:

So, before the course, I had some basic understanding of communication, but not how to use the language while flying the aircraft. And I did not know the sequence of events when communicating like getting the route clearance. Then, I was able to speak English for real (Interviewee 4).

These reflections proved that the learners were given the opportunity to apply the gained knowledge into the real world during the simulation sessions.

4.2.2.1.4 *Building awareness.* The fourth category included remarks of participants made in relation to this category included references to situational awareness, effective communication, and cognitive load. For instance, Interviewee 2 picked the “situational awareness” keyword when he was asked to describe his learning experience with just one word. Similarly, Interviewee 3 highlighted this topic with the following words: *“This course helped me, like I said before, increase my knowledge about communicating with other traffics like what was going around me.”* He further commented in another instance:

I mean, we are going to be pilots, and this course was related to my ideal job in the future. So, I am going to be talking mostly to other people who have not done that before. So, I think, the situational awareness, that we are going to be prepared and we will know what to do and when to do (Interviewee 3).

Furthermore, Interviewee 4 reflected on the learning outcomes of this course by referring to the situational awareness he built: *“You know, it is an experience to use in the future. One of the expectations I had from this course was towards improving the situational awareness.”* With regard to building awareness for the real world, he further commented:

For me, during the initial part of training I could not even recognize what he (referring to the air traffic controller) was saying if he was talking to me or to other traffic. So, it was too hard. And, particularly when you are in the approach phase of the flight, things were more difficult due to the workload. However, this course provided the advantage of preparing myself in advance (Interviewee 4).

That is, the learner developed a sense of awareness towards the challenges he could face in his future work setting. Considering these reflections, it was concluded

that the simulation-based pilotage course also served as a tool for student pilots to build awareness for their profession.

4.2.2.1.5 Other learning gains. The fifth and final category included students' reflections on the learning gains other than developing English language proficiency through simulation-based training. These were inclusive of developing pilotage skills as well as decision making skills. The former learning gain, for instance, was reported by Interviewee 1 who commented: *"For me, it (referring to the simulation) was also good for handling the airplane. It helped me improve my skills in terms of controlling and handling the aircraft more smoothly."* As for the development of decision making skill, Interviewee 3 stated that the course *"...was helpful in making decisions. It is like making me feel much more professional because I am able to speak the language practically."* Finally, Interviewee 2 mentioned setting personal goals in the course: *"I was the first person to do the tasks. Simply completing them first was important for me. So, I had to step in first and do it first."* Setting personal goals was, therefore, considered as another learning gain for the student pilots enrolled in this course.

4.2.2.2 Theme 2 Communicative competence. The second theme identified in the qualitative content analysis of the interview data was labeled as Communicative Competence. A total of eleven codes were identified, which yielded three categories that made up this theme.

4.2.2.2.1 Improved communication. The first category included participants' reflections on improved communication skills throughout the course. While some students highlighted the fact that they developed these skills through active use of English language, others mentioned improving communicative skills by learning the sequence of events in ATC communication. As such, when asked about his overall description of English language proficiency development in the course Interviewee 3 stated *"...so far, so good. I think it has been keeping us pretty sharp in specific phase of Aviation English, and that is good. Also, it was extremely helpful since we actively use English for communicating with the ATCOs."* According to Interviewee 4, however, the development of communicative competence was related more to getting to know the chain of communication as well as its timing. In this regard, Interviewee 4 commented *"I learned the communication as well as the timing like when to take the*

clearance and report my position. I learned the total composition of communication procedures. What to do and when to do... Yeah, that was good.” On similar grounds with Interviewee 4, Interviewee 1 reported *“It was kind of simulating the flight for real. The flights on the ground improve the communication part and getting familiar with all the procedures. It was kind of similar to flying a real aircraft”* when he was asked to reflect on his overall flight simulation experience. These reflections showed that the simulation-based pilotage course improved student pilots’ communication skills in varying ways.

4.2.2.2.2 *Variations in language use.* The second category of Theme 2 (Communicative Competence) included participants’ responses signaling the variations in language use in the context of aviation. That is, student pilots indicated that they developed communicative skills in this course since they were able to expose themselves to various accents and practice the language use in non-standard flight operations as well as in various situations in the target work setting. For instance, Interviewee 2 highlighted his experience of language use in a variety of settings when asked about the ways, if any, he improved himself in this course. Accordingly, he commented *“I would like to say that throughout the tasks you were giving us, we were able to reach some specific communication from different accents in different airports.”* Building on this reflection, Interviewee 5 and Interviewee 1 reported developing communicative skills for non-standard use of the language. As such, Interviewee 5 stated *“Actually, it (referring to the course) improved my ATC communication skill. I mean, it helped me on how to use the language in emergency situations.”* Similarly, Interviewee 1 contributed to the discussion by commenting *“I have a similar opinion to my friend. It is all about standard phrases. If you are not in an emergency situation it would be enough. However, you need to know what to say in an emergency. That is my gain in this course.”* Considering these comments, it was concluded that this course was helpful for student pilots in developing communication skills in non-standard situations, as well.

4.2.2.2.3 *Learning gains regarding vocabulary.* The third and last category was associated with the contribution of vocabulary development to the ATC communication skills. That is, student pilots believed that learning new vocabularies

was related to developing proficiency in communication with the ATCOs. To illustrate, Interviewee 5 reported:

“I can say that it is always good to have some background knowledge related to emergency situations like knowing words, for example, related to the problems with the aircraft. I should be able to report it. This helps me a lot when communicating with the ATCOs in emergency situations” (Interviewee 5).

Along similar lines with his friend, Interviewee 1 also made a connection between vocabulary development and ATC communication skills. When asked to describe his experience of learning aviation vocabulary by means of flight simulation, he commented *“I would like to say that it is quite beneficial. Why? Because everything you learn during the flight simulation will be right in front of you in the cockpit when you communicate with the ATCOs. Therefore, it is practical since you use it already.”* These statements proved that learning contextual vocabulary is, according to student pilots, related to developing communication skills in the target work setting.

4.2.2.3 Theme 3 As good as it gets. The third theme identified in the qualitative analysis of the interview data was labeled *As Good As It Gets* based on participants’ reflections on their overall learning experience in the simulation-based pilotage course. This theme, therefore, includes student pilots’ comments regarding future improvements to the course as well as its current shortcomings. In this regard, a total of thirteen codes yielded four categories that made up this theme.

4.2.2.3.1 Course design. In this first category, the participants explicitly stated that the simulation-based pilotage training course should always be a part of the pilot training curriculum. As such, when asked about the pros and cons of the course, Interviewee 5 commented:

“I learned everything. I really did not know anything before. I think that this course should be a must-have course in the second year, not in the third and fourth year... in the first semester because our flights start in the

second semester of the second year. We should learn these things before our flights” (Interviewee 5).

Similarly, Interviewee 1 stated that the course enables learners to be cognitively occupied so it should always be offered by the department. His reflections on this issue were as follows: *“I believe we will need it together... If you are operating the aircraft, you will need the communication. Imagine... If you have it separated, your mind will just get into the communication not doing both at the same time.”* However, as can be deduced from this statement, which was a counter argument to separating the simulation from communicative tasks, Interviewee 2 suggested having two separate must-have courses when asked about the changes he would like to have in this course: *“It might be like separating the simulation and communication. I mean there can be an Aviation Communication course. There must be a course dedicated to simulating the ATC communication.”* These statements showed that student pilots had the same opinion of having a must-have course like the existing course, yet there was no common ground as to whether there should be a separate course dedicated to ATC communication. Overall, this issue was noted by the researcher as one of the possible future improvements to the course design.

4.2.2.3.2 Crowded setting. The second category was related to the setting of the course. Although students were found to have met on a common ground that the number of students enrolled in the course should be decreased, they had various reasons for it. While some students argued that they would develop an increased degree of self-awareness toward their lacks in this course if there were less students, others commented that they would be more encouraged, and the course would be more effective in decreasing the L2 speaking anxiety. Interviewee 3, for instance, reported *“Definitely, the number of students should be decreased. It is too much. And, why decrease? We will get more feedback in the classroom and on the tasks. So, it will encourage me to give more”* when he was asked to reflect on the things he would change in this course. On the other hand, Interviewee 1 commented *“...it could be better if they decreased the student number. Because imagine you do the simulation and the communication in small group. It is going to be more effective, and I will understand what to improve.”* These suggestions showed that the number of students enrolled in the course was a common concern for student pilots.

4.2.2.3.3 *Suggestions regarding the simulation sessions.* The third category was related to the suggestions for an improved simulation experience. In this regard, student pilots mainly highlighted that they would need more time to get familiar with the control panels of the aircraft used for instructional purposes and that they would like to have improvements in the flight control hardware. For instance, Interviewee 5 reported that familiarization with the aircraft itself is a challenge when he was asked to reflect on the difficulties regarding simulation-based training. In this regard, he commented: *“I think getting familiar with the aircraft is a challenge because you cannot know the controls of all aircrafts. I mean the instrument panel, etc.”* (Interviewee 5). He further stated that they needed some time to get used to the simulator. This issue was also highlighted by others. To illustrate, Interviewee 2 reported:

“Well, my first time, I could not manage the radio and the airplane at the same time. Because of that I forgot to slow down and made a hard landing. I was out of the runway. That was challenging so I need some time to get used to the simulator” (Interviewee 2).

On the other hand, Interviewee 1 mentioned the room for improvement regarding the flight control hardware in the following excerpt:

“I would like to say something related to the controls. I think that part is fine but there must be a dedicated rudder. At first, I realized that, okay, it would be okay to use the sidestick and control the rudder. But then I realized that it was not that easy on the sidestick” (Interviewee 1)

These comments showed that there are several opportunities to improve the quality of learning in the simulation-based pilotage course.

4.2.2.3.4 *Suggestions regarding the readback performance tasks.* The fourth and last category included participants’ suggestions regarding the readback performance tasks assigned to students on a weekly basis. For instance, Interviewee 3 commented

that completing these tasks before anyone else in the classroom was particularly important for him: *“I had to step in and complete it first so that I would not be influenced by other answers. I wanted to focus on the tasks and be able to use the language on my own.”* This comment showed that the Web 2.0 platform used for assigning the readback performance tasks might have influenced student responses since they were able to access other students’ responses. In addition, Interviewee 5 highlighted the need for instant feedback upon completion of the tasks, and he commented:

“I can say one specific thing. Not changing but adding something... We have tasks which are very useful and important, but I think you need to add the true communication like the correct answer. And then I could see if I made a mistake, or I missed something. I need some kind of feedback” (Interviewee 5).

Considering these comments on the future changes that students would like to make to this course, it was concluded that the readback performance tasks required some modifications for improved learning gains.

4.2.2.4 Theme 4 Simulation as the cure for ESA. The fourth and last theme identified in the qualitative analysis of the interview data was associated with the positive influence of simulation on student pilots to decrease their English speaking anxiety. A total of sixteen codes were identified in relation to three categories that made up this fourth theme.

4.2.2.4.1 Signs of English speaking anxiety. The first category included signs of participants anxiety to speak English. Although all participants highlighted the existence of anxiety, their reflections signaled various reasons for it. These reasons ranged from the lack of English speakers outside the AE classroom to the development of feelings such as nervousness and anxiety. Interviewee 1, for instance, mentioned the lack of opportunity to use English language outside the AE classroom, which led to the feeling of anxiety when he needed to speak English in real life. The following

excerpt from the interview data explicitly shows the existence of English speaking anxiety in Turkish context:

“I believe that we do not have multiple opportunities in Turkiye to communicate with other people who speak English well. This is still a big problem for us. We cannot practice the language enough before we start flying. This problem I think is about anxiety” (Interviewee 1).

The reasons for English-speaking anxiety among student pilots were not limited to the nature of the Turkish context, and it extended to learners’ personal judgments regarding their knowledge of target work setting. As such, Interviewee 4 associated the anxiety to speak English with his lack of content knowledge and commented:

“Maybe due to not knowing everything related to aviation, I was anxious. For me, during the initial part of training I could not even recognize what he was saying if he was talking to me or to other traffic. So, it was too hard. And, particularly when you are in the approach phase of the flight, things were more difficult due to the workload. However, this course provided the advantage of preparing myself in advance” (Interviewee 4).

This excerpt showed that English-speaking anxiety may appear among student pilots due to lack of content knowledge, which was further supported by Interviewee 5 who reported: *“I think I have a similar experience. During the initial parts of the training, it is inevitable that we lose communication with the ATC... like to get lost with the ATC. So speaking was not that easy at first.”* Another reason for the English-speaking anxiety was associated with cognitive issues. In this regard, Interviewee 3 stated *“I was nervous. Because flying the aircraft and talking to the ATC at the same time... it was too much for me.”* However, student pilots consistently reported benefiting from the simulation-based course design to overcome the English-speaking anxiety. To illustrate, Interviewee 3 completed his statement above with the following words: *“Like I said before, my first try was not successful for this reason, but on my second try I overcame this problem. Now, I feel good to speak to air traffic controllers.”* Similarly, Interviewee 4 commented *“...this course provided the advantage of preparing myself in advance”* after reporting his lack of content

knowledge causing the anxiety to speak English. Finally, Interviewee 1 highlighted that simulation sessions were “...quite beneficial because you simulate the exchange of information, and you no longer hesitate when speaking to the air traffic controller.” These comments proved that English-speaking anxiety was true for student pilots in the Turkish context, yet it could be treated by means of simulation-based course design.

4.2.2.4.2 *Learning gains associated with the ESA.* In this second category, learners provided explicit statements signaling the learning gains in decreasing the ESA over the course of a semester. For instance, when asked to reflect on whether being a shy person or not during any communication in English, Interviewee 2 commented:

“From time to time, I feel hesitated to speak with someone in English. If I do not know the appropriate word, yes. However, I believe that I have changed. This course changed many things for me in terms of feeling better when talking to other people in English” (Interviewee 2).

This excerpt showed that one of the learning gains of this course could be directly associated with the English-speaking anxiety. Another instance of linking the course outcomes with the ESA was when Interviewee 4 reflected on his overall experience of simultaneously flying the aircraft and communicating with the ATCO:

“I think it was challenging. It was like... you know... doing everything. ...separating the task of controlling the aircraft and communication... It is all about that. Then, you are going to be used to the ATCO and never worry about speaking English. When he talks, your mind just replies to him” (Interviewee 4).

These student comments showed that simulation sessions were, according to, effective in helping learners overcome the English-speaking anxiety.

4.2.2.4.3 *Impressions on the simulation.* The third and last category was shaped by student pilots' impressions on simulation. While the simulation was reported by learners as a facilitator to overcome the English speaking anxiety, it was found that it also encouraged their personal development to become a skilled pilot. As such, Interviewee 2 reported *"I started the simulation this year and I think it is great. That is really helpful. I like that. That is great. After the first simulation flight I decided to buy a sidestick, yoke, and rudder."* Similarly, Interviewee 1 commented *"For me, it was also good for handling the airplane. It helped me improve my skills in terms of controlling and handling the aircraft more smoothly"* when he was asked to reflect on the overall personal improvements in this course. In addition, Interviewee 4 stated that he had developed a sense of prudence in terms of performing routine tasks in the target work setting. Finally, Interviewee 5 concluded that the simulation sessions were like a discovery for him since he learned a lot to become a better pilot. Considering these reflections on the overall influence of simulation sessions, it was concluded that simulation was an effective tool and a cure for student pilots to decrease the English speaking anxiety thus becoming a skillful pilot.

Thus far, the present study reported on the quantitative and qualitative findings. The chapter that follows moves on to the discussion of these findings in relation to the existing research into Aviation English.

Chapter 5

Discussion and Conclusion

This chapter presents an in-depth discussion of the research findings in relation to the existing literature. In this regard, implications for each research question are discussed under separate subheadings below. Then, the pedagogical implications and suggestions for future research are provided. Finally, an overall conclusion for the present study is given.

5.1 Discussions on the Research Questions

The present study was designed to explore the overall influence of simulation technology on the English language learning experiences of student pilots. In this regard, the novelty brought by the simulation-based training was tested in relation to the English speaking anxiety, willingness to communicate, vocabulary development, and the readback performance of ab-initio pilots enrolled in a tertiary level pilotage program in Türkiye, which was the main purpose of the RQ1. In addition, the perceptions of ab-initio pilots toward simulation-based training in the aviation context were explored, which formed the basis for the purpose of the RQ2. The discussions in the following headings are presented in accordance with the aforementioned research purposes.

5.1.1 Discussion on RQ1. The aim of the first research question was to explore the overall English language learning experience of student pilots in the simulation-based learning environment. In this sense, the present study found out that student pilots had an effective learning experience in the simulation-based training program. That is, the learners improved their overall vocabulary knowledge, readback performance, willingness to communicate in L2 and reduced their English speaking anxiety level.

The process of acquiring a second language is an intricate undertaking that is affected by numerous factors that can be classified into cognitive, social, and environmental components. Cognitive factors encompass variations in ability, motivation, and learning processes among individuals (Gardner et al., 1985). These

characteristics are essential in the process of learning and becoming skilled in a second language. Social variables, on the other hand, refer to factors such as the learner's contact with others who speak the language natively, their relationships with others, and their immersion in the culture (Long, 2017). Environmental variables pertain to the presence and accessibility of resources, including educational opportunities, technology, and instructional approaches (Lightbown & Spada, 2013). Grasping the interaction of these factors is, therefore, overly complex. However, it can be argued hereby that the simulation-based training program implemented in the present study has been successful in overcoming this complexity toward facilitating the English language learning experiences of student pilots in the Turkish context. For instance, English speaking anxiety was already identified as a notable issue among student pilots in Türkiye (Demirdöken & Okur, 2023). Also, willingness to communicate in English, despite the lack of sound research in the Turkish context, was reported to significantly influence the language learning process in the Thai aviation context (Suwisutthimontree, 2018). In addition, despite being an indispensable part of ESP teaching, vocabulary learning lacked profound research in the Turkish aviation context because we still need to build on these recent contributions (Dinçer & Dinçer, 2021; Fainman & Tokar, 2018, 2021). Finally, the scope of the research into the readback performance was limited to pilots who were already practicing their profession and thus, the international audience lacked scientific findings in this matter. The present study, therefore, pioneered the research into the student pilots' readback performance, vocabulary development, English speaking anxiety, and willingness to communicate in the aviation context.

5.1.1.1 Discussion on RQ1a. The first sub question of the first research question was about the English speaking anxiety of student pilots in the simulation-based Aviation English training. Within the realm of aviation, the risks are significant, as any misinterpretation has the potential to result in extremely severe repercussions. It is, therefore, crucial to develop a solid understanding of the role of English speaking anxiety in the overall English language proficiency of student pilots. Since English serves as the common means of communication among pilots, air traffic controllers, and other aviation workers, it is quite possible that the feeling of anxiety may be encountered by these groups of speakers when they intend to interact in English in numerous instances.

In the simplest term, English-speaking anxiety is a type of social anxiety that occurs when persons are required to communicate in English. In other words, it can be described as “the fear of expressing oneself verbally using the English language” (Pabro-Maquidato, 2021, p. 46). It is frequently distinguished by feelings of anxiety, apprehension about committing errors, and a tendency to avoid speaking in English contexts (Horwitz et al., 1986). It is also argued that the English speaking anxiety is associated with three major emotional traits: communication apprehension, fear of negative evaluation, and test anxiety (Horwitz et al., 1986). Being a complex phenomenon itself, it is known to negatively influence the second language learning, and the indicators of it are observed in learners in various forms, all of which impede and constrain learners’ ability to speak English. MacIntyre (1995), for instance, posits a negative association between anxiety and performance, asserting that it has detrimental effects on learners' performance including speaking. Considering these previously reported reflections of English speaking anxiety on learners, the present study aimed to identify the English speaking anxiety levels of student pilots, eliminate, if possible, the negative consequences of this phenomenon in the aviation context, and hopefully improve the learning gains for the target learner group. Accordingly, the English-speaking Anxiety Scale, adapted by Demirdöken and Okur (2023) into Turkish aviation context, was instrumented by the researcher, and the findings showed that Turkish student pilots had high levels of English speaking anxiety ($M=60,67$). The rationale behind this judgment lies in the scoring of the scale. The minimum score that can be collected in this scale is 16 whereas the maximum score is 80, and higher scores indicate higher degrees of English speaking anxiety. Therefore, it was concluded that the English speaking anxiety is a significant constrain for student pilots in the present study. In fact, the research into English speaking anxiety shows that it has always been a challenging matter in Turkish higher education institutions, and recent studies have reported the existence of this issue among various groups of tertiary level students. Mede and Karairmak (2017), for instance, found out that teacher candidates were suffering from the speaking anxiety. Also, they concluded that being exposed to a foreign language, either through a preparatory program or by having a foreign friend, aids language learners in achieving greater proficiency in the foreign language and thus reduces their level of fear when speaking it. On similar grounds, Vural (2019) reported on a sample of more than 2,000 tertiary level students enrolled in the English Language Teaching and English Language and Literature departments from 31

Turkish higher education institution, and he pointed out the presence of the anxiety to speak English in both groups yet in varying degrees. In a more recent study, more than 4,000 individuals from various age groups in Türkiye were quantitatively analyzed, and it was concluded that English learners in Türkiye exhibit a modest degree of speaking anxiety (Akar, 2021). However, less, if none, was known about this phenomenon in the Turkish ESP context, particularly the aviation context. Therefore, the present study stands out for exploring this phenomenon for the first time in the Turkish ESP context and reporting it as a significant challenge for student pilots, which needs to be eliminated for improved learning gains.

The results obtained here may have implications for developing a solution to decrease the level of English speaking anxiety among Turkish student pilots. Although the present study found out that the target learner group had high levels of anxiety, it went beyond this finding by empirically testing a novel approach to language learning for the purpose of overcoming the English speaking anxiety in this context. A number of strategies were applied in various English language teaching settings ranging from the five-dimensional coping strategy (Kondo & Yang, 2003) to four-dimensional anxiety-reducing strategy (Fujii, 2017), a teacher-oriented strategy (Chen & Lee, 2011), and the cooperative learning strategy (Nagahashi, 2007). However, this research is a first step towards a profound understanding on the use of simulation technology to reduce the English speaking anxiety of ESP learners. The findings of paired samples t-test showed that there was a statistically significant decrease in English speaking anxiety levels of student pilots after being enrolled in ten simulation sessions that replicated the real work setting for learners. This finding was further supported by learners during the focused-group interview. The students commented in several instances that they were able to overcome the anxiety to speak to the ATCO despite suffering a lot from this phenomenon at the beginning of the simulation sessions. One of the students had even stated *“I think it was challenging... Then, you are going to be used to the ATCO and never worry about speaking English. When he talks, your mind just replies to him.”* Considering these findings, it can be hereby argued that instrumenting the simulation technology to reduce English speaking anxiety in the ESP context is the strength of this piece of work since this finding has implications for not only the aviation professionals in Türkiye but also those around the world.

5.1.1.2 Discussion on RQ1b. The second sub question of the first research question was about the willingness to communicate (WTC) in L2, which is a prominent individual difference variable that has garnered significant attention in second language (L2) research.

The concept of WTC, as formulated by McCroskey and Baer (1992) for L1 settings, refers to the deliberate inclination to participate in communication when presented with the chance. It can, therefore, be conceptualized as a framework that symbolizes a mental preparedness to commence communication, particularly verbal interaction. According to MacIntyre and his associates (1989), who adapted this phenomenon into L2 settings, WTC combines the psychological, linguistic, pedagogical, and communicative aspects of language.

Findings regarding the WTC levels of Turkish students from various L2 communication settings are well documented in the literature (Öksüz-Zerey & Cephe, 2020; Sinnett & Alishah, 2021; Yetkin & Özer, 2022; Yıldız, 2022b). These studies commonly reported issues related to WTC in Turkish L2 settings. Yetkin and Özer (2022) have recently concluded that the secondary school L2 learners had just a moderate level of WTC that was significantly influenced by gender and age. Similarly, Yıldız (2022b) reported a moderate level of WTC among tertiary level students ($n=711$), and the classroom environment strongly influenced their WTC. Building on it, Öksüz-Zerey and Cephe (2020) also concluded that tertiary level English language learners were somewhat willing to interact in the English language. These studies conducted in the Turkish L2 learning settings clearly show that L2 learners do not possess high degrees of WTC in English, and this multifaceted construct is influenced by numerous variables, as suggested by MacIntyre and his associates (1989). However, the study of WTC in the ESP context is rarely reported, which makes it difficult to develop a solid understanding of this construct among ESP learners and thus, impeding the development of English language proficiency. The present study has extended the prior research by identifying the construct of WTC in Turkish aviation context, which is another key strength of this work.

Considering the aforementioned lack of profound research into WTC in ESP settings, a limited selection of findings can be analyzed with reference to the findings reported in the present study. For instance, a recent attempt reported on the Indonesian ESP learners' WTC levels and concluded that students were not willing to communicate in English (Salam et al., 2021). In a more recent study, it was once again

reported that the WTC levels of ESP students varied to a great extent and that it was influenced by various reasons including proficiency , tasks, activities, and the learning materials (Sjaifullah & Laksmi, 2022b). The limited knowledge we have on the construct of WTC in the ESP settings appears to be even more limited in the aviation context. The one of the few reports on it was on the Thai aviation context (Suwisutthimontree, 2018). This study focused on the ground staff at an international airport in Thailand, and it reported on the WTC levels of these aviation workers as well as the demographic variables that influenced their WTC levels. According to the results of that study, Suwisutthimontree (2018) found out that Thai ground staff had a moderate level of WTC in English, and that age significantly influenced the level of WTC whereas gender did not. On similar grounds, it was found out in the present study that ESP learners in Turkish aviation context had a moderate level of WTC. Building on this common finding, this work has further concluded that simulation was an effective instructional tool to increase the level of student pilots WTC in English. Since there used to be no research finding regarding the WTC levels of aviation professionals other than the ground staff, this study has, for the first time, shed light on an unexplored research area. This research has, therefore, made a substantial contribution by helping researchers to develop a solid understanding of the construct of WTC among student pilots and by offering a scientifically proved method to increase the WTC levels of these learners. Considering the fact that there is a statistically significant correlation between the construct of WTC and academic performance in English (Qu, 2023), this innovative method of instrumenting the simulation technology for instructional purposes in the Aviation English classroom may directly contribute to improving the English language proficiency of student pilots in Turkiye as well as those around the world. This may, in turn, increase the safety and communication both in the air and on the ground. Future research seeking to use this technology should, therefore, attempt to explore various other factors that may influence the WTC levels of student pilots so that improved learning gains can be attained by this group of learners.

5.1.1.3 Discussion on RQ1c. The third sub question of the first research question was related to the vocabulary learning in the aviation context. The purpose of analyzing it in this context was to develop a better understanding of the possible facilitating role simulation technology may play in the Aviation English classroom.

This exploration would, in turn, yield substantive results to be discussed in the light of the prior research findings regarding the ESP vocabulary acquisition.

Various investigations have extensively validated the significance of solid vocabulary knowledge in the ESP context (Dinçer & Dinçer, 2021; Ghalebi et al., 2020). It was also pointed out that a major obstacle to a learner's proficiency in an L2 is a restricted vocabulary repertoire (Jones & Durrant, 2010). Building on this statement, Gifford (2013, p. 18) argued that “a person having more breadth and depth of vocabulary has wider competence to communicate and to understand a communication and is to be considered intelligent.” Therefore, vocabulary acquisition in the ESP context has been the focus of the research for many years, and a number of suggestions have been made to facilitate the vocabulary learning process for ESP learners. These propositions have mostly highlighted the use of various vocabulary learning strategies (VLS).

Language learning systems have been characterized in different ways. While O'Malley and Chamot (1990), for instance, categorized VLS into three major types: metacognitive strategies, cognitive strategies, and social strategies, Oxford and Crookall (1990) classified them into two broad categories: direct strategies and indirect strategies. These classifications were extended by Schmitt (1997) who classified VLS into two primary categories as discovery strategies and consolidation strategies. Based on these VLS strategies, Duong (2022), for instance, adopted the strategy proposed by Schmitt (1997), and it was concluded in this most recent study that ESP learners utilized techniques to memorize ESP lexical elements only to a moderate extent. Also, the metacognitive methods were much more utilized than the social (consolidation) strategies. However, the most significant finding of this recent study was that although ESP learners utilized VLS for ESP due to its effectiveness and consistent application, their vocabular learning impeded due to their lack of confidence and absence of a conducive practice environment. Considering this finding reported recently in the ESP context, it can be argued that implementing the simulation technology and teaching context-specific vocabulary in a simulated learning environment where student pilots could instantaneously practice the new words was a significant innovation in the aviation industry.

The results obtained in the present study also showed that this intervention was effective in terms of facilitating the vocabulary learning process for student pilots. Prior studies into Aviation English vocabulary learning have not proposed any finding

that can be compared against the findings presented here because those studies instrumented tools or technologies other than the simulation. To illustrate, the study conducted by Fursenko and her colleagues (2021) empirically validated the efficacy of employing the Quizlet computer-based flashcard tool in instructing prospective air traffic controllers (ATCOs) on terminology relevant to their profession. Their empirical data demonstrated that Quizlet was an extraordinarily successful instrument for learning vocabulary, specifically in the context of improving students' proficiency in speaking abilities and their desire in learning aviation English. Unlike their sampling, the present study was conducted with the student pilots yet, the results were similar in that the vocabulary teaching in the Aviation English course was facilitated over the course of a semester.

On the other hand, the research into vocabulary teaching in the aviation context appears to have a similar research design that can be cross compared. In 2017, virtual reality (VR) was instrumented in an ESP context by Madini and Alshaikhi (2017) for the purpose of teaching ESP vocabulary to twenty Saudi female students who were enrolled in the Didactic Terminologies in English Course. They designed their research to last six weeks, during which the students engaged with virtual objects by means of observing 360-degree movies that pertained to fundamental counseling abilities. They instrumented a pre-test and a post-test and compared the scores to determine the effect of virtual reality films on language retention. They reported that there was a statistically significant distinction between the two tests with a favorable change from the pre-test to the post-test, suggesting that students exhibited the greatest improvement in the latter. Their findings also indicated that the utilization of virtual reality movies effectively enhanced the postgraduate students' ability to recall specialized vocabulary in the ESP context. Similarly, the present study found out a statistically significant difference between the vocabulary knowledge pre-test ($\bar{X} = 49,05$, $\sigma = 11,897$) and post-test ($\bar{X} = 80,48$ ($\sigma = 9,070$) scores, and the vocabulary knowledge of student pilots after the simulation sessions was significantly higher than their vocabulary knowledge before the simulation sessions ($t(20) = -36.752$, $p = .000$). It can be hereby concluded that new technologies can be successfully integrated into various ESP curricula if serious thought is given to learners' context-specific needs.

However, there is one particular study in the literature that needs to be compared to the present study thoroughly. The study conducted by Dinçer and Dinçer (2021) utilized serious gaming for instructional purposes in the aviation context. To be more

specific, they designed their research to determine the effectiveness of *X-Plane* game to teach Aviation English vocabulary. Their sampling consisted of thirty student pilots who were enrolled in the Aviation English course. While the control group was reported to have received conventional in-class teaching by means of PowerPoint slides, the experimental group was reported to have completed the “flight school mode” of the *X-Plane 11* game which comprised of ten different scenarios. The researchers collected quantitative data before and after the intervention and they had interviews with the experimental group. Their findings showed that both groups were similar in terms of overall vocabulary knowledge before the intervention whereas there was a statistically significant difference between the two groups in favor of the experimental group. Accordingly, the researchers concluded that the incorporation of serious gaming into the aviation English training greatly augmented the vocabulary acquisition of the aspiring pilots. On similar grounds with Dinçer and Dinçer (2021), the present study aimed to determine if the Microsoft Flight Simulator, which is considered a serious game, could facilitate the vocabulary acquisition in the aviation context. On the other hand, the most significant difference between the aforementioned study and the present study was that sampling in the latter was composed of civil aviation pilot candidates, not the military aviation pilot candidates. Considering these two most recent attempts to utilize serious gaming in the aviation context for vocabulary teaching, it can be argued that the aviation industry and the ESP teachers can benefit from serious games to a great extent in the educational settings.

A number of reasons for the successful integration of serious games into Aviation English classrooms can be considered based on the existing literature. First, if serious games are designed with educational factors in mind they may potentially be more impactful even though they are defined as games (Abt, 1975). That is, the focus should be that they are characterized by a deliberate and well-planned instructional objective, rather than being primarily designed for entertainment purposes. Accordingly, the simulation software used in the present study has been in the market for 40 years, and it is not intended for pure entertainment, rather it is preferred by many pilot candidates for the development of basic flight skills as well as getting familiar with the instruments in various types of aircraft. Second, engaging in serious gaming can serve as an optimal method for honing one's skills in the desired language (Dinçer & Dinçer, 2021) since individuals have the opportunity to achieve communication objectives that enhance their ability to produce desired outcomes

within a game setting. Accordingly, the student pilots in the present study stated in the focus-group interview, for instance, that “...*everything you learn during the flight simulation will be right in front of you in the cockpit. Therefore, it is practical since you use it already*” (Interviewee 1) and that “you are going to be used to the ATCO and never worry about speaking English. When he talks, your mind just replies to him” (Interviewee 4). Considering these comments on the opportunity to practice and master communication by means of serious games, it would be right to consider the simulation and serious games as novel approaches in the Aviation English classroom.

However, it should be noted that our knowledge on the relationship between serious gaming and language acquisition in the ESP context, particularly Aviation English, is limited. The rare reports on this matter included, for instance, the work of Johnson and his colleagues (2005). They conducted a study to examine the effects of serious games on language acquisition among military students. Additionally, they created a serious game with the goal of improving communication skills in the desired language. Subsequently, he directed his attention towards the cultural acumen of the game's participants. The game was created as conversational simulations using non-human participants. In addition, Chen and Hsu (2020) investigated the impact of a serious game, *Slave Trade*, on the acquisition of vocabulary and subject knowledge related to history. The results demonstrated that serious gaming provides a highly immersive and meaningful learning platform since playing the game during the treatment procedure led to a considerable improvement in students' performance. As a result, the present study has extended the research into simulation and serious games by reporting significant findings on the effectiveness of these novelties for vocabulary teaching in the aviation context.

5.1.1.4 Discussion on RQ1d. The fourth and the last sub question of the first research question was related to the readback performance of student pilots. The process of reading back the instruction given by the ATCOs can be argued to include four main phases: (1) listening to the instruction, (2) comprehending the instruction, (3) processing the instruction, and (4) responding to the ATCO over the radio. Apart from completing this readback process, the pilots also need to maintain the control of aircraft simultaneously. The readback is, therefore, quite a challenging task for pilots considering the complex nature of dealing with not only cognitive tasks but also the motor tasks. This can be an even more significant challenge for those who are already

enrolled in pilotage training or about to start it. In this regard, it becomes crucial to design as many learning opportunities as possible for student pilots to practice the readback tasks for improved readback performance in the real work setting. The present study can be argued to have the right design to assess the readback performance of student pilots due to several reasons.

First, the researcher identified that no study had reported on the readback performance of student pilots, and thus a solid research design was developed to obtain reliable results regarding how well the student pilots performed on the readback performance tasks that replicated the real world. The study was conducted by means of a flight simulation software which simulated a variety of real flight scenarios as well as the real readback procedures in accordance with the manual of radiotelephony published by the ICAO (International Civil Aviation Organization, 2007). That is, the student pilots engaged in real-like flight scenarios that included exchanges of real air traffic control messages over the course of a semester. The students were first given the theoretical training by the researcher on the type of instructions, the sequence of events in the corresponding communication, and the content of the readback message to be given over the radio. Then, the student pilots practiced the scenario on the simulator by both controlling the aircraft and communicating with the ATCO during each simulation session. The course plan was designed to replicate each and every phase of the typical flight scenario that would require the student pilots to communicate with the ATCOs over the radio. In this sense, the readback procedures taught in the present study started with the pre-flight (communication on the ground), continued with the take-off, initial climb, climb, cruise, initial descent, descent, approach, and landing phases (communication in the air), and finally it ended with the taxi-out, taxi to parking position, and engine shut-down phases (after-landing communication). Therefore, the data collected regarding the readback performance of student pilots can be argued to reflect the true performance of the learners in the target work setting, which is a powerful indicator for Aviation English teachers as well as flight instructors to assess the communicative competence of the student pilots against the language proficiency requirements published by the ICAO. This feature of the present study, therefore, makes it a unique and pioneering development in the ESP context.

Second, the present study with its unique research design has, for the first time in the existing literature, shed light on an unexplored research area with reliable results

regarding the readback performance of student pilots and thus, it stood out from the prior research. The readback performance is not an unknown phenomenon in the aviation industry. Since this phenomenon is in direct association with the communication between the pilots and the ATCOs, reports dating back to 1999 highlighted the significance of it for the safety of air travel. To begin with, Morrow and Prinzo (1999) designed a research study to analyze the complexity of messages given by the ATCOs and the effects of these messages on pilots. The problem statement in their study was that communication issues emerged partially due to the cognitive overload experienced by pilots when dealing with complicated messages. Also, they argued that incorrect readbacks were more likely to occur when messages were longer, as longer messages might lead to confusion or interference between different parts of the message stored in working memory. Their findings showed that ATC message complexity and length had significant influence on the readback performance of pilots. Also, the number of readback errors was in relation to age differences. Building on this argument, Prinzo and Hendrix (2006, 2009) analyzed how message complexity and length influenced the readback performance of pilots in the two reports presented to the ICAO. The common feature of these two reports was that the data analyzed confirmed that there was a correlation between the complexity and length of messages and an increase in readback errors and pilot requests. In this sense, the results of these two reports resembled the results presented in the study of Morrow and Prinzo (1999). Although these studies all signaled the same issue in the aviation context, no recent report is available on this matter except the efforts of Barshi and Farris (2013). While Barshi focused mostly on the effects of linguistic properties in the first part of their book, Farris investigated the effects of message length in relation to the cognitive load of pilots, L2 proficiency, and the readback performance. The findings presented in the second part of their book were quite similar to what was presented in the prior research. That is, the duration of the message impacted the participants' ability to perform tasks, such as navigating and accurately recalling information. It also affected their ability to speak, including their accent, comprehensibility, fluency, and confidence. In addition, longer messages had a negative effect on all of these measures. In brief, the research showed that These findings corroborate the overarching premise that real-life conditions, such as the requirement to multitask, negatively impact pilots' ability to speak, and that these impacts are noticeable to listeners.

The most important conclusion to be drawn from the prior research into the readback performance is that all findings corroborate the overarching premise that real-life conditions, such as the requirement to multitask, negatively impact pilots' ability to speak, and that these impacts are noticeable to listeners. Therefore, developing a solid understanding of this phenomenon is crucial to ensure effective communication between pilots and the ATCOs. Considering this need, the present study has focused on a relatively less explored research area by analyzing the readback performance of student pilots for the first time in the literature. The rationale behind this investigation was that the existing literature lacked evidence on possible instructional solutions to prepare student pilots for the cognitively challenging work setting. In this regard, it was scientifically proven that instrumenting flight simulation tools for instructional purposes was an effective method that helped the researcher determine if student pilots could benefit from this novel approach in the ESP classroom to meet the English language proficiency requirements of the ICAO. To be more specific, it was found out in the present study that student pilots, who were exposed to various flight and radio communication scenarios in the simulator, benefited from the simulation sessions and managed to reach the minimum language proficiency standards (Level 4) in terms of fluency, comprehension, and pronunciation. The findings reported in the present study can be argued to reflect the true nature of student pilots' English language proficiency on these three language skills because (1) their performance was assessed by means of a scoring rubric developed in accordance with the English language proficiency requirements of the ICAO, (2) the scoring was completed by two experienced Aviation English teachers including the researcher himself, and (3) the inter-rater reliability of the scorers was found high. In addition, the student pilots explicitly reported in the focus-group interview that they benefited from the simulation sessions and improved their communication skills significantly. To conclude, the present study was a notably successful contribution to the research into the readback performance in that the flight simulation was scientifically proven to be effective in the attainment of industry standards by improving the ESP learners' readback performance.

5.1.2 Discussion on RQ2. The second research question of the present study was “What are the perceptions of student pilots in Türkiye toward simulation-based Aviation English learning?” Focus-group interview was the qualitative data collection

tool to seek an answer to the RQ2. To briefly remind the findings in the qualitative data analysis, four major themes, namely *occupational outcomes, as good as it gets, communicative competence, simulation as the cure for English speaking anxiety*, were identified. In the light of these emerging themes, it is possible to draw conclusions regarding how the perceptions of student pilots were shaped after being enrolled in a simulation-based English language learning environment.

The results of this work have, first of all, unraveled that student pilots perceived the simulation-based learning as beneficial to attain occupational skills, and the first theme in the qualitative data analysis was identified *occupational outcomes*, accordingly. This finding was in line with the quantitative findings regarding the statistically significant improvement in the vocabulary knowledge, willingness to communicate in English, and readback performance as well as the significant decrease in English speaking anxiety level of student pilots. In accordance with these quantitative findings, the responses in the focus-group interview included student pilots' reflections regarding the ESP learning gains described in detail in the findings chapter. Overall, it can be argued hereby that the simulation-based pilotage course successfully met the fundamental values of ESP programs. For instance, ESP is defined as a goal-directed language education program (Robinson, 1991). Therefore, any ESP course should be designed based on the clearly identified learning needs of learners and it should aim to equip learners with the specific language skills required in the target work setting. Accordingly, the present study was in line with the learning needs identified for the Turkish student pilots recently (Demirdöken, 2022). What is more, another recent study had reported that English speaking anxiety level of student pilots in Türkiye was high (Demirdöken & Okur, 2023) and thus, the simulation sessions were tested as a potential cure for this issue, which proved to be effective in overcoming this problem. This conclusion can also be made based on the reflections of learners highlighting that they were getting prepared for their prospective job in many ways throughout the course; they were building awareness on the issues like cognitive overload, situational awareness, and the need for clear and effective radio communication; they were building both propositional and procedural knowledge in the course; they were becoming more and more proficient in speaking English for occupational purposes. The second fundamental feature of ESP course that was met in the present study was the ESP course content. It is argued that content of the course is dictated by the unique needs of a specific group of learners Richards and Schmidt

(2002). In the case of this study, one of the requirements to be eligible to receive the Commercial Pilot License (CPL) is that the learners need to meet the ICAO English language proficiency requirements. The proficiency levels of student pilots are tested by licensed raters in the authorized test centers, and the learners need to perform at a minimum level of four out of six on the following six language skills: pronunciation, vocabulary, fluency, comprehension, structure, and interactions. The content of the simulation-based pilotage course was in accordance with most of these skills and thus, it was concluded that the course was in line with the core feature identified by Richards and Schmidt (2002). This was supported by the participants during the focus-group interviews since they stated that the course content was associated with their prospective job and that they were able to familiarize themselves with the tasks in the target work setting.

The results of this work have, in the second place, unraveled that student pilots perceived simulation-based learning as a “cure” for their English speaking anxiety. In this sense, the most significant difference it made for the student pilots was the opportunity it brought in terms of applying the theoretical knowledge into practice during the simulation sessions, and thus decrease the anxiety to speak English with the ATCOs. That is, the learners were able to simulate the real life by using the target language. This was an experience that was as real as possible and there was not much chance for these learners to practice this jargon-filled language of aviation outside the classroom due to contextual reasons, which was also reported to exist in the Chinese context (M. Zhang, 2020). In fact, it is already the most significant feature of the simulation to create an environment to fly an aircraft and communicate with the ATCOs, which can otherwise be exceedingly difficult. As described by Fletcher and his colleagues (2015), a computer-based simulation game is a form of entertainment software that is grounded in reality, centered around achieving certain objectives, and allows for user interaction. Therefore, these games are thought to offer language learning material that is inherently abundant in connections by exposing learners to meaningful situations. Considering this nature of simulation, many studies have portrayed its effect in various English language learning settings. For instance, in an attempt to determine the extent to which simulation-based education contributes to substantial advancements in English spoken language production, Angelini and García-Carbonell (2019) designed a study in which a cohort of university engineering students received instruction through the use of simulations to enhance their

acquisition of English as a second language. The learners received instruction in English through a combination of classroom-based learning and a large-scale, real-time web-based simulation. The findings demonstrated substantial advancements across students in four language-related domains: vocabulary, pronunciation, range of expression, and grammar. Another exploration of simulation in the English language learning settings was made in the study conducted by Ranalli (2008). He examined whether The SIMs™, a popular video game, might be used as an effective educational tool for university-level ESL learners. To do so, he developed extra materials that were designed to fit specific criteria for suitability in computer-assisted language learning tasks. The study employing mixed techniques discovered statistically substantial enhancements in language acquisition, along with a generally favorable response to the alterations among users. Apart from these two studies with the ESL/EFL learners, the study of Annie Chang and her colleagues (2013) assessed the effectiveness of simulation-based learning as a teaching method to enhance the English reading skills of senior college students whose first language is Chinese. They employed a quasi-experimental methodology, specifically a nonequivalent control group design, to establish the causal relationships between the intervention and the outcomes. A total of 101 students participated in this study, with a response rate of 92.6%. The results showed that the intervention group had significantly superior average scores in ENP reading skills while dealing with unfamiliar words in the article, vocabulary, and comprehension compared to the control group. Furthermore, the students who received intervention demonstrated greater enhancement in their English reading skills, as evidenced by both quantitative and qualitative data. Therefore, they concluded that simulation-based learning can enhance ESP nursing students' English reading proficiency. Finally, a more recent attempt was made to enhance the efficacy of English language acquisition for students studying English as a foreign language (EFL) (Chang et al., 2020). They implemented augmented reality (AR) technology to facilitate contextual classroom learning and perform instructional experiments for situational English language learning. Their statistical analysis mainly indicated that the experimental teaching method was significantly more effective than the control group's traditional teaching style. To be more specific, the academic achievement of the students in the experimental group was reported to have significantly improved, and the feedback from students was favorable. In addition, the experimental findings demonstrated that the incorporation of augmented reality (AR) scenarios in real-life

situations boosted students' confidence in English language acquisition and the utilization of AR teaching materials in context-based classes offered nearly authentic scenarios, leading to enhanced student satisfaction with the learning process. These studies have, in common, proved that simulation was an effective tool for ESL, EFL, and ESP nursing students in terms of improving their learning gains. However, no study has so far reported on the implementation of simulation in the ESP aviation context. In particular, there was no insight into the effectiveness of simulation in decreasing the English speaking anxiety of student pilots. Therefore, it was hereby tested if it could be the cure for a common issue among student pilots. Since the statistically significant decrease in student pilots' reported levels of English speaking anxiety was supported by their comments in the focus-group interview, simulation-based training was, for the first time in the literature, reported to be an effective cure student pilots' English speaking anxiety. In this sense, while the present study supported prior research findings regarding the efficiency of simulation-based training in English language learning settings, it has extended those findings by reporting on its efficacy in the context of aviation.

To sum up all research findings, it was found out that, after the implementation of the simulation-based training over the course of a semester, (1) student pilots' readback performance, vocabulary knowledge, and willingness to communicate in L2 significantly improved, (2) their English speaking anxiety significantly decreased, (3) and they overall reported improved learning gains in the simulation-based learning setting as well as some suggestions regarding the course design and technological infrastructure. Having discussed the findings in the present study, the following subheading will describe the pedagogical implications of these findings.

5.2 Pedagogical Implications

The results obtained in the present study have implications for a better understanding of the simulation-based learning in the ESP Aviation English context. The implications presented below are significant guidelines for ESP teachers, curriculum designers, and aviation professionals to develop effective Aviation English course plans that may help student pilots attain the language skills required by the ICAO.

To begin with, the most significant implication to be drawn from the present study is undoubtedly the novelty brought by the simulation-based learning method. It was concluded that it was overall an effective tool in improving student pilots' readback performance, willingness to communicate in English, and vocabulary knowledge as well as decreasing their English speaking anxiety. Considering the unique nature of each ESP setting, it is of utmost importance for researchers to correctly identify the needs of a particular group of learners and propose instructional solutions that may meet their needs. Accordingly, the successful integration of the computer-based simulation into the Aviation English classroom in the Turkish aviation context has proven to be an instructional solution. It may, therefore, be adopted by other Aviation English teachers in Türkiye as well as by ESP teachers around the world for improved learning gains.

In addition, the innovative implementation of the computer-based simulation has been a promising alternative to the conventional ESP Aviation English teaching. The particularities of the Turkish aviation context necessitate meaningful learning experiences for student pilots to overcome the English speaking anxiety. Since it was already reported that Aviation English learners in Türkiye suffer from this problem to a great extent (Demirdöken & Okur, 2023) and the findings of this study showed that simulating the real work setting is effective in decreasing the English speaking anxiety of Turkish student pilots significantly, other tertiary level institutions offering Aviation English courses may also consider adopting this method.

Another implication to be noted is that willingness to communicate in English is a crucial variable affecting the academic performance in language learning settings and thus, any scientifically proven instructional solution, such as the simulation-based learning suggested in this study, should be considered by ESP teachers. However, it should not be disregarded that the construct of willingness to communicate includes instances of speaking both inside and outside the classroom which, therefore, requires researchers to develop instructional solutions that may have an impact on both situations. In this sense, it becomes crucial to give ample amounts of opportunity for students to use the target language in a meaningful way, particularly in contexts like Türkiye where English is not the common means of communication outside the classroom. The overall perception of learners in the present study regarding the simulation-based learning was that it was effective in preparing them for the real work setting and thus, they developed confidence to speak English with the ATCOs. In other

words, they were ready to speak English at a particular moment by virtue of the simulation sessions. Similarly, this innovative method, if adopted, may also be a solution for ESP teachers to help their ESP learners develop a sense of willingness to communicate in English in their particular work settings.

Apart from the aforementioned implications of this study, the ESP practitioners can also benefit from the simulation-based vocabulary teaching method tested over the course of a semester. Although vocabulary teaching in ESP settings has been reported a lot and a number of methods have been proposed to be effective, not much is known about the role of computer-based simulation games in teaching aviation-related vocabulary. This appears to be even more blurred in the Turkish setting where many tertiary level institutions offer pilotage training program without any particular focus on learning gains regarding the student pilots' vocabulary knowledge. What is worse, some institutions do not even offer any Aviation English but just focus on learners' communicative competence which requires content and vocabulary knowledge. Therefore, it can be a solid step for those institutions to adopt the simulation-based learning method for vocabulary teaching.

Also, this study has implications regarding the most effective way of implementing the simulation-based learning into Aviation English classrooms. As is the case for all instructional methods, the simulation-based learning has some restrictions. To illustrate, it may be costly to set up a learning environment to simulate the flights in real life. The reason is that there is a need to have high-end computers to run the simulation software and to buy the software as well as flight control instruments separately for each computer. Therefore, ESP teachers may experience challenges to receive finance to create this learning environment.

Most importantly, the results demonstrated in this work provide a new perspective on the readback performance of pilots. Since previous research focused only on pilots who were already performing their profession, but not the prospective pilots, no solution had been proposed to overcome this phenomenon before this under-researched group of learners stepped into a real cockpit. It can be judged from the findings of the present study that computer-based simulation games can be a less costly solution improve student pilots' readback performance which, in turn, gradually help them cope with the cognitive overload experienced while maintaining the communication with the ATCOs and flying the aircraft simultaneously. As a result, the proposed solution of the present study is applicable not only to the tertiary level

institutions but also to flight schools where student pilots are given the air-to-ground communication lessons.

5.3 Conclusions

The present study was designed particularly to investigate an unexplored research area in English language teaching so that improved learning gains could be attained by ESP Aviation English learners. In this sense, simulation-based learning method was adopted as an intervention to test its influence on Turkish student pilots' English speaking anxiety, willingness to communicate in English, vocabulary knowledge, and readback performance. In accordance with these research purposes, five main conclusions were drawn based on the research findings. First, it was concluded that Turkish student pilots had high levels of English speaking anxiety yet, simulation-based learning was an effective method in significantly decreasing this anxiety. Second, the participants were found to have a moderate level of willingness to communicate in English before taking part in the simulation sessions, which significantly improved over the course of a semester through exposure to simulated learning in the aviation context. Third, there was a statistically significant improvement in the aviation-related vocabulary knowledge of student pilots after being exposed to an implicit vocabulary teaching by means of a computer-based simulation. Fourth, all participants significantly improved their readback performance by simulating the air-to-ground and ground-to-air radio communication for a period of one semester and the assessment of their readback performance yielded results that corresponded to the minimum proficiency standards (Level 4) of the International Civil Aviation Organization (ICAO). Fifth and the last, student pilots overall perceived the simulation-based learning as an effective and innovative method in the Aviation English classroom along with some room for improvement.

The present study can be argued to significantly contribute to the research into Aviation English teaching by presenting a scientifically proven method as a solution to common issues among student pilots in the Turkish setting. Since there was no research reporting on the use of computer-based simulation for instructional purposes in the Aviation English classroom, this study has been a pioneering piece of work both for ESP teachers and researchers. That is, ESP teachers practicing their profession in the field of Aviation English may adopt this method for improved learning gains in

relation to the four variables mentioned above. Also, for the ESP researchers, this study can be a source of inspiration to test the efficacy of computer-based simulation in similar teaching settings. Considering the hypotheses tested and the conclusions drawn on these hypotheses, this study has been a success in transforming the Aviation English classroom toward equipping the student pilots with the language skills that will meet the industry standards.

5.4 Suggestions for Future Research

The present study has, without doubt, been influential in adopting a relatively new technology and implementing it in an unexplored ESP teaching setting. Also, the findings reported in this study have been significant in helping researchers and ESP teachers to develop a better understanding of the English speaking anxiety, willingness to communicate in English, ESP vocabulary knowledge, and readback performance of student pilots in Türkiye. However, the variables tested here may not fully represent the English language learning experiences of student pilots in a wider context since language learning is a complex matter in nature and is affected by a number of factors not included here. Therefore, further work to improve on these new developments is suggested. In this sense, several interesting aspects may be explored further by identifying the relationship between the English speaking anxiety and other individual learning variables that may influence English language learning experiences of student pilots. In addition, the obtained results justify further development of the simulation-based learning method for student pilots enrolled in the Aviation English courses offered in the tertiary level military institution in Türkiye. Alternatively, this study can be replicated in the Turkish ESP setting by increasing the availability of computer-based simulators so that student pilots may simultaneously explore this novelty in the Aviation English classroom. Another suggestion for future research may be the integration of generative artificial intelligence (GenAI) tools to identify how these tools may influence the same variables tested in this study since there is a scarcity of research into and findings on GenAI integration in educational settings.

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