

Fossilisation and technology: exploring ways of addressing erroneous language acquisition via
computer-assisted tools and artificial intelligence for Greek adult learners of English as a
Foreign Language

by

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ABSTRACT

Fossilisation is among the most frequent issues appearing in Second Language Acquisition (SLA) studies. It is a phenomenon that is responsible for the emergence of common language mistakes even in advanced learners. Research has shown that there are many challenges in the attempt of researchers to properly define the phenomenon, though it cannot be considered as fully untreatable. On the contrary, it is suggested that, under certain circumstances, fossilised patterns can be treated and may not reappear in the learners' linguistic output. Using technology in language learning has enough benefits, according to studies.

As such, a combination of Computer-Assisted Language Learning (CALL) and Mobile-Assisted Language Learning (MALL) could provide learners with interesting activities and accurate input that could assist with their overcoming of fossilised patterns. Instead of focusing exclusively on more traditional CALL and MALL technologies, the use of Artificial Intelligence (AI) chatbots was encouraged for the development of the study, due to the continuous development of AI technologies and their use in various educational-related studies. The effectiveness of AI chatbots is still evaluated in studies, and it is an area that has not been considered for research within the Greek English as a Foreign Language (EFL) setting.

This study aimed to investigate effectiveness of the AI chatbots in addressing the number of mistakes and errors Greek adult learners of English can produce. In order to do this, the study used mixed methods and tasks that were completed using the participants' computers and a chatbot of their choice. Thirty-four participants were recruited for the purpose of this study, and provided data that was collected through the use of homework tasks, an AI chatbot task, questionnaires, and interviews.

The results showed that participants in both groups managed to produce more

accurate language while working with the chatbot, and after noticing the input produced by the chatbot, they managed to almost completely avoid making mistakes in their written English. The participants also expressed a favourable attitude towards the use of artificial intelligence technology in language learning, understanding that it can be a useful tool in language learning, though it should still be used alongside the human factor (teachers). The findings of this study can encourage teachers and EFL material providers to encourage the use of AI technologies in order to enhance individual learning, as well as develop materials that will be enforcing the use of AI applications in language learning. The study has also managed to provide a clearer image of the types of errors Greek adult learners of English usually produce, a fact that could help teachers and material designers to focus on certain areas while creating learning materials. Finally, the study also recommends a series of longitudinal research projects that will test the effectiveness of AI applications in different stages, and for longer periods of time.

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LIST OF ABBREVIATIONS

AI	Artificial Intelligence
AIED	Artificial Intelligence in Education
App	Application
CALL	Computer-Assisted Language Learning
CEFR	Common European Framework of Reference
CMCF	Computer-mediated Computer Feedback
EAP	English for Academic Purposes
EFL	English as a Foreign Language
ELT	English Language Teaching
ESL	English as a Second Language
E-Learning	Electronic Learning
ICT	Information and Communications Technology
ITS	Intelligent Tutoring Systems
L2	Second Language
MALL	Mobile-Assisted Language Learning
PDA	Personal Digital Assistant
RQ	Research Question
UCLan	University of Central Lancashire

Chapter 1: Introduction

1.1 Background of the Study

The need of communication between tribes, nations and cultures has been a humanitarian need that has emerged since the dawn of mankind. The biblical myth of the Tower of Babel, which shows how humans were deprived of the one language they spoke as an immediate consequence to their hubris shows that having a language that everyone can speak and communicate with is necessary. Thus, the concept of the lingua franca was born. Over the centuries, various nations have adopted and used a different lingua franca for a variety of reasons that do not need to be mentioned here. Times and needs change, however; and as humanity stepped into the 20th century CE, English has been adopted as a common language that is being recognised and spoken in a global scale.

The English language has become an undisputed symbol of globalisation. In these recent times, where communication and interactions between people belonging to different cultures are common, English has become the most common, and well-accepted language for communication. Because of this, Greece could not disregard the importance of English as a lingua franca (Jenkins, 2015). English is a global language, now spoken by more than 1.5 billion people worldwide, and is the most widely used language in the domains of business, academia and pop culture. As Greece is a member of the European Union and an active partner in international trade and commerce, English is essential for Greeks to conduct business with international traders and trading participants. A study by the British Council (2013) found that English is the language of international business, and proficiency in this language is essential for success in global trade and commerce. Therefore, Greeks learn English to be able to communicate effectively with international partners and compete in the global job market.

In Greece, English has become a mandatory subject in schools and universities, and there is a growing interest in learning English as a second language among the Greek population. English became a mandatory subject in Greek schools after a significant historical transition. Following the National Language Act of 1967, English was retained as a required subject in all schools, with secondary schools shifting to Greek-medium instruction (Zervas, 2017). This shift in language policy reflects the broader historical context of education in Greece, which played a crucial role in the ideological construction of Greek national identity after the end of Ottoman colonial rule (Zervas, 2017). Greek students expect to use their English language skills in domains such as science, technology, and academia. Many academic journals and research papers are written in English, and attending international conferences often requires proficiency in this language. The use of English as the language of instruction in tertiary education is also increasing in Greece, as more universities in Greece offer courses in English. In fact, the National and Kapodistrian University of Athens, the Aristotle University of Thessaloniki, the Technical University of Crete, the Athens University of Economics and Business and the International Hellenic University of Greece are the top institutions in Greece that deliver English language courses, while more institutions include at least one English for academic purposes course in their course syllabus (www.globalscholarships.com).

As a result, Greek tertiary students need to be proficient in English to attend these courses and access a wider range of educational opportunities. In addition, many Greek academics publish their research in international journals, and proficiency in English is essential for communicating their research findings to a wider audience, a fact that is true for many international academics according to Crystal (2012). However, while the reasons that have been mentioned so far are relevant to adult learners and users of English, the same does not apply to Greek young learners of English. For them, concepts such as business, trade and academia are completely irrelevant. English is the language of popular culture, including Hollywood movies,

TV shows, and music. Many of the most popular movies, TV shows, and songs in Greece are in English, and being able to understand them without subtitles can enhance the viewing experience. In addition, many popular video games are developed in English, and playing them in their original language can improve gaming skills and provide access to more content. Learning English can also help Greeks stay up to date with the latest trends in pop culture, as much of it is produced in English-speaking countries, a trait that is also commonly found in other parts of the world (Kramersch, 2013).

Adding to this chorus, there are also expert opinions that voice the importance of learning a foreign language, such as English. After all, the significance of learning English as a foreign language is well-documented and has been the subject of extensive research. Research has shown that learning English as a foreign language has significant implications for individuals' cognitive, social, and professional development. It can improve cognitive abilities, increase self-confidence, and foster cultural awareness and empathy. Various studies have shown that learning a second language can improve cognitive abilities, such as memory, attention, and problem-solving skills (Bialystok, 2009). Learning English can also increase self-confidence, as it is an accomplishment that can generate new opportunities and provide new experiences to individuals. Additionally, a study by Sarsenbaeva suggests that the development of intercultural competence through the learning of English as a foreign language has been emphasised as essential, especially in the context of global communication and understanding (2021). Furthermore, the impact of language anxiety on language achievement has been investigated, highlighting the need to address learners' anxiety to enhance language learning outcomes (Horwitz, 2001; Karakiş, 2020).

Moreover, learning English as a foreign language has been found to enhance students' speaking performance, with the use of storytelling techniques being recommended to improve

language skills (Natasia & Angelianawati, 2022). The influence of cultural awareness on motivating students to learn English as a foreign language has also been stressed, highlighting the interconnectedness of language and culture in the learning process (Abushihab, 2016).

Additionally, the importance of language learning strategies and autonomy in the context of foreign language learning has been recognised, with studies emphasizing the role of autonomy and its relationship to language course achievement (Ahsanah, 2020; Karakiş, 2020).

Finally, the significance of internationalisation and study abroad experiences in facilitating language proficiency through immersion has been acknowledged, underscoring the benefits of exposure to English in diverse cultural contexts, as Ahwireng suggests (2022). Also, the impact of language proficiency and learner beliefs on language learning has been a subject of investigation, with studies highlighting the importance of experiential learning and exposure to English through various media for language development (Tanaka, 2003).

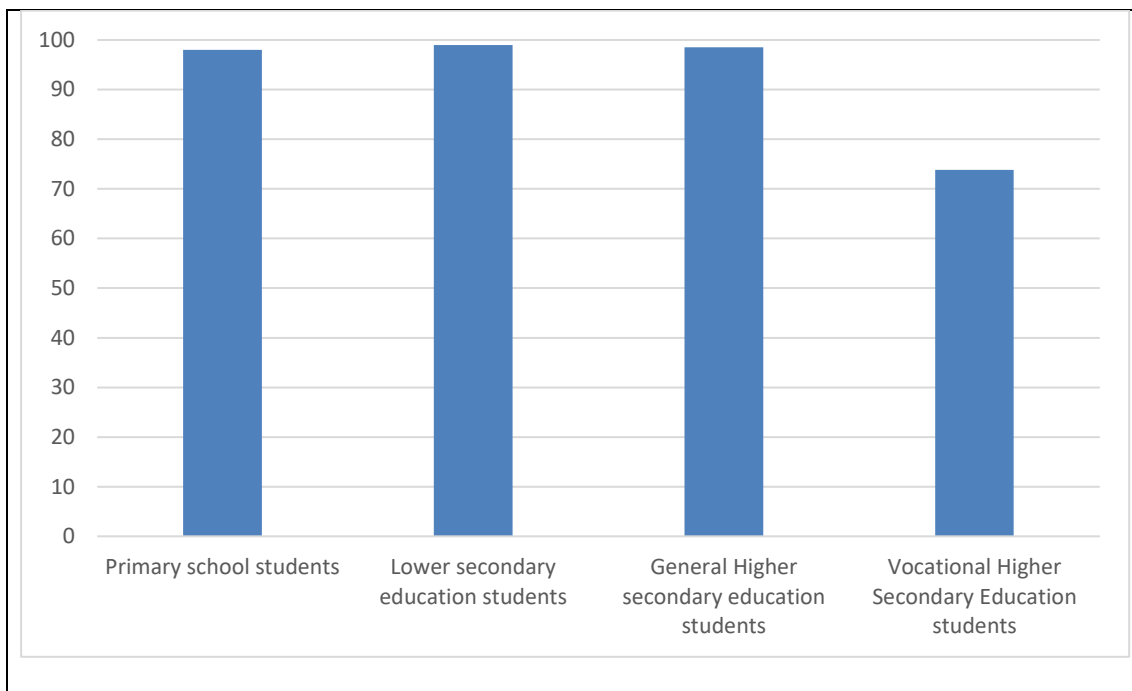
Having established the significance of learning English as a foreign language, it would be wise to look at this significance from the Greek perspective. Greek students learn English for a variety of reasons, reflecting the multifaceted nature of language acquisition and its implications for personal, academic, and professional development. The significance of learning English for Greek learners is highlighted by the global prominence of the English language in various domains, including academia, business, and technology. Research has shown that English proficiency is associated with enhanced career opportunities, as it facilitates access to international job markets and academic resources (Galantomos et al., 2019). The same study underlines the importance of English language skills in the context of trilingual settings has been investigated, highlighting the complex language functions of trilingual individuals living in Greece.

Yashima & Zenuk-Nishide (2008) believe that the ability to communicate with people

from other countries and cultures can broaden one's perspectives and can lead to more meaningful conversations. This is also true for Greek learners of English, with studies showing that learning English can foster cultural awareness and empathy, as it exposes Greeks to different cultures and perspectives. A good example is an interesting study showing the implications of vowel learning in diglossic settings for Arabic-Greek learners highlight the relevance of multilingual environments in modern societies, emphasising the importance of language learning in diverse linguistic contexts (Georgiou & Themistocleous, 2020). This trait has become even more prominent due to the impact of the COVID-19 pandemic on the online learning experience of university students in Greece, as it has began the investigation of the ways behind the acquisition of skills and beliefs about online learning in the context of language education (Andrie et al., 2023).

Looking at these points, it should come as no surprise that the Ministry of Education and Religious Affairs in Greece has decided to provide a lot of opportunities for students to learn the language in general education. The government has invested in programs and curricula to improve English language education in schools and universities, and there are many language schools and online resources available for those who want to improve their proficiency. The British Council and the American Embassy in Athens also offer English language courses and resources to Greek students, including teacher training programs and exchange programs for students. As a result of this, a significantly high number of Greek students has been observed, according to existing data:

Table 1.1: Percentage of Greek students learning English 2021-2023



Note. Adapted from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Foreign_language_learning_statistics&oldid=616229#Primary_education Copyright 2023 by Eurostat.

However, no matter the amount of education and exposure to a language, Greek learners of English will eventually fall victim to linguistic challenges that emerge over time and relate to their overall linguistic competence and performance. And despite globalisation and the constant need to be able to communicate effectively and accurately, many learners in Greece often stop using the language they spent years mastering, resulting in lots of inaccuracies and awkward moments in communication with foreign people that often force them to study the language once again.

Learning (or re-learning) a foreign language, however, might not prove to be an easy task, especially when it comes down to adult learners. There are many difficulties that adult learners often come across in their learning journeys that are often discussed in the studies of second language acquisition. The need to feel that an adult learner is a competent speaker of English as a foreign language, even after years of actively using the language, is the origins of

this study. Despite the challenges and the difficulties that adult learners often face, seeing if their performance could improve gave birth to two hypotheses that became the foundations of this study. This study attempts to examine:

- a) whether it is possible for adult learners to overcome erroneous instances of English as a Foreign Language (EFL) in their output (e.g. incorrect use of grammatical phenomena, spelling mistakes), and
- b) whether technology can be an effective tool in overcoming these erroneous instances, when they appear.

After having established the background of the study, the rest of this chapter will present the status of English as a Foreign Language in the Greek learning concept and will conclude with an outline of how this study is organised.

1.2 The Greek EFL Context

1.2.1 An Introduction

As already established, English is one of the most widely spoken languages in the world and is considered the language of international communication. In Greece, English is taught as a foreign language (EFL) from an early age and is a crucial part of the education system. In fact, English plays an important role in the foreign languages' curriculum design at the Ministry of Education and Religious Affairs and is the most widely taught foreign language in Greece, with French and German coming next. However, despite its esteemed and high position in Greek foreign language education, there seems to be a widespread dissatisfaction both among pupils and parents with the way English lessons are delivered at school.

In public school there is a limit on the amount of contact hours during which students are exposed to English as a Foreign Language. According to the Common Foreign Languages Instruction Syllabus (2016), students attending the first two years of primary school have two

contact hours per week, while students attending Years 3 to 6 have three contact hours per week. Students attending Years 1 to 3 of both lower secondary and higher secondary education have two contact hours per week. It should be noted, though, that these are not 60-minute classes, but the running time can be between 30 to 45 minutes. Also, some of these classes are often missed or cancelled, due to unforeseen reasons, such as school festival, public holidays, staff meetings, strikes, or even unavailability of teaching staff in certain schools, further decreasing the total amount of the public-school students' contact and practice time with the English language.

In addition, when the researcher of this current project was attending public school, there were fewer contact hours compared to more recent years. Primary school students began learning English in Year 3 and would only attend two-hour classes instead of three. Lack of consistency between primary and secondary education (some students would start from A1 as soon as they enrolled in Year 1 of lower secondary school) or lack of materials (only one coursebook was used in all three years of higher secondary school) are among the problems that have been part of the English language learning context in the Greek public school. It is for these reasons that those who want to learn English (and any other foreign language for that matter) must seek help elsewhere. Thus, a vast number of pupils of all levels attend private language institutes to receive quality foreign language instruction and also have the opportunity to sit for the prestigious external foreign language examinations offered by foreign examining bodies (e.g. Cambridge University, University of Michigan, French Institute and Goethe Institute). An interesting article by Papaefthymiou-Lytra (2012) underlines the unjustified obsession of Greeks with obtaining certificates as early as possible. This trait, along with the conspicuous ignorance and lack of adequate preparation of state education regarding the foreign language examinations is largely responsible for pushing the state school to the side lines of foreign language education, a situation that is further burdened from the fact that the allocation of resources and time to foreign language instruction in state schools is grossly inadequate.

Despite this, however, the requirements of the English language are met in almost every aspect in public and professional life. Constantly increasing needs in tourism urge young learners to become competent speakers of the language in order to assist the vast numbers of foreign travellers that visit the country throughout the year. A high level of English is also a major requirement in most job advertisements, both in the public and the private sector. As a result, the need to be able to prove that someone is a competent speaker of the language (not to say an advanced speaker) is growing steadily over time, and candidates are often judged regarding their linguistic competence and accuracy in a variety of employment and communication settings.

1.2.2 History of EFL in Greece

The teaching of English as a foreign language in Greece has a long history, dating back to the early 19th century when the country was under Ottoman rule. During this period, English was primarily taught in missionary schools organised by British citizens that considered themselves as “friends of Greece” as a way of gaining access to the British Empire. In the early 20th century, the Greek state began promoting the teaching of English in public schools, and it became a compulsory subject in secondary education in the 1950s. Since then, English has become an integral part of the education system in Greece, and it is now taught from the first year of primary school (Vrettaros & Tsakiridou, 2016).

1.2.3 Current State of EFL in Greece

The Ministry of Education and Religious Affairs oversees the education of English as a foreign language in Greece by designing the curriculum and setting the standards for teaching. The current curriculum focuses on developing students' communicative competence in English, with an emphasis on the four language skills: reading, writing, listening, and speaking

(Papageorgiou, 2019). When it comes to the education provided by the state, the first foreign language that young students are introduced to is English during the first year of primary education. The curriculum is expanded to include a second foreign language at the fifth-grade level, either French or German depending on student interest. The instruction of English is required, along with the instruction of a second foreign language, with the option to select either French or German once more (Institute of Educational Policy, 2023). This continues throughout junior high school, which is the first three years of secondary education. Learners of Greek are required to study one foreign language during their senior year of high school (the final three years of their secondary education), but they have the option to study a second language besides English, French, or German as well.

There has been a recent shift towards a more communicative and interactive approach to teaching, with less emphasis on grammar and rote learning (Vrettaros & Tsakiridou, 2016). This shift is also evident in the use of public-school textbooks, as the materials that are being used reflect a more communicative approach in teaching, and a less teacher-focused approach. Additionally, in more recent years, technology has started playing a more prominent role in the Greek EFL classroom. Recent governments have started replacing traditional blackboards with interactive whiteboards, and a rising number of computers are being installed in the classrooms. This has enabled teachers to provide more high-quality English language lessons, bringing the level of activities closer to that of foreign language schools (Nteli & Zafiri, 2017).

Despite the various points of progress, there have also been many significant challenges as well. These challenges include (but are not limited to) restricted exposure to English outside of the classroom and disengaged or unmotivated students. However, one of the significant challenges of English education in Greece is the lack of qualified, properly trained and evaluated teachers. Although there are lots of English language teachers, many lack formal qualifications,

a significant amount of training, not to mention that all of the public-school teachers are not evaluated the way their foreign colleagues are (Karras, 2017). This can lead to outdated teaching methods and selection of materials, which, by no means, align with the best or more current practices in English language education, can be ineffective in developing students' language skills, often forcing them to look for other alternatives.

Another challenge is the lack of exposure to English outside of the classroom. As also mentioned, limited exposure to English outside of the classroom presents a significant challenge for EFL teachers in Greece. Unlike in other European countries, Greece has relatively few English-speaking expatriates inhabiting it, which means that students may not have many opportunities to practice their English language skills outside of the classroom in an accurate way and in a variety of communication contexts (Vrettaros & Tsakiridou, 2016). As a result, students may struggle to develop their communicative competence, despite having a good understanding of grammar and vocabulary. Finally, English teachers in Greece may encounter disengaged or unmotivated students, a fact that can severely hinder the learning process. Teachers may need to use innovative strategies to engage students and promote active learning (Papageorgiou, 2019). This may include the use of technology, collaborative learning, and project-based learning approaches.

The role of private sector regarding the state of education of English as a foreign language in Greece has been hinted plenty of times so far. As it was mentioned above, public schools often prove inadequate to provide a high-quality level of instruction, forcing private schools to fill in any gaps in education. To be more specific, this problem stems to the fact that public schools offer a lower total number of contact hours as well as less rigorous coursework than private language institutes. The achievements and accomplishments of Greek young learners in English language classes at state schools can be quite different compared to those

attending private lessons at foreign language schools. This difference is attributed to a series of factors, such as differences in contact hours, a lack of standardization in the services provided, and, of course, variability in the students' rate of learning (Mattheoudakis and Nicolaidis, 2005). Foreign language schools and institutes are, therefore, part of a thriving private sector that offers intensive instruction in foreign languages to students of all ages, with the majority of students being learners aged 8 years old and older, with more and more adult learners joining the student body of these centres over the recent years. These centres, and the lessons that are provided, focus primarily on preparing students for exams, and educate students so that they are prepared to take specialised tests that, if passed, will allow them to obtain a language certificate. Exams are the primary focus of these classes (Mattheoudakis & Alexiou, 2009). It is also expected that the vast majority of Greek students will continue to enrol in English language classes offered by private foreign language schools, regardless of the amount of instruction and practice opportunities they receive at state schools.

Figures related to the foreign language schools and their activities are impressive and give more insight to the impact of private education in English for Greek learners. According to Batziakas (2006), there are currently almost 9,000 private English language institutes in Greece, and each one has an average of 200 students enrolled. Other findings have revealed that approximately 80% of school-aged children in Greece attend foreign language institutes, and the annual expenditure of Greek families on foreign language education expenses for fees and textbooks totals approximately 880 million euros (Lakasas, 2005).

Overall, it is safe to mention that the context of English as a Foreign Language (EFL) instruction in Greece is one of a kind in Europe and reflects both the intense (and often persistent) interest of Greek parents and students in acquiring language skills in other countries. Because Greek is a language that is spoken by a smaller number of people than other languages,

Greeks have a strong belief in the necessity of mastering at least one foreign language. This will enable them to communicate with speakers of other languages both within and beyond the borders of their country. As a result of its preeminent position in the world and the widespread belief that it will afford speakers of it significant educational, occupational, and socioeconomic opportunities, most Greeks decide to study English as their first language outside of Greek.

1.2.4 Attitudes of Greek learners of English towards the language

One of the research questions in this study investigates the perception of the Greek learners of English regarding making mistakes. However, before moving to the aspect of making mistakes in their linguistic output, and how important this might be, it would be interesting to investigate the attitude of the Greek learners of English towards the language itself.

Attitude is an important factor in language learning, as it heavily influences the learners' motivation and willingness to engage in the learning process (Gardner, 1985). As far as the Greek learners of English are concerned, attitude plays a significant role in their approach to English language learning. Existing studies, such as those by Papageorgiou (2019) or Teo & Arkoudis (2019) have attempted to explore the attitude of Greek learners of English, including their motivations for learning and mastering the language, their perceptions of the language, and what is their opinion regarding the overall learning process stage. There also seems to be enough information regarding the impact of culture and expectations of society on Greek learners' attitude towards English language learning.

To start things first, it is important to look at the various factors that motivate Greek learners, urging them to learn English. One of the main reasons why Greeks study the language is its importance in global communication, particularly in the fields of business and tourism (Papageorgiou, 2019). English is widely used in international trade and commerce, and many multinational companies require their employees to have a good command of English (Crystal,

2012). In addition, Greece is a popular tourist destination, and knowledge of English can facilitate communication with visitors from English-speaking countries (Papageorgiou, 2019). Another motivator for learning English is the academic and career advancement. English is the language of instruction in many universities around the world, and Greek students who want to study abroad need to have a good command of English (Papageorgiou, 2019). In addition, proficiency in English is often a requirement for employment in international organizations and multinational companies (Crystal, 2012).

While looking at the opinion English language learners have regarding the language itself, it is safe to assume that Greek learners of English generally have a positive perception of the language. English is often viewed as a useful and prestigious language that can provide opportunities for personal and professional growth (Papageorgiou, 2019). English is also associated with modernity and globalization, and its use is seen as a sign of being cosmopolitan and educated (Teo & Arkoudis, 2019). However, there are also negative perceptions of English among some Greek learners. Some view English as a difficult language to learn, particularly with regards to pronunciation and grammar (Teo & Arkoudis, 2019). There is also a perception that English is a foreign language and that its use may lead to a loss of national identity (Papageorgiou, 2019). While these voices belong to a very small minority of the Greek population, they might sometimes work as demotivators for an equally small number of students, a fact that has also been witnessed by the main investigator of this study while teaching in Greece.

The attitudes and the various points of view of Greek learners of English can also involve the learning process. Studies have shown that they usually depend on individual factors such as age, gender, and educational background. Younger learners tend to have a more positive attitude towards language learning, while older learners may be more resistant to change (Papageorgiou,

2019). Male learners also tend to have a more positive attitude towards language learning than female learners (Teo & Arkoudis, 2019). Overall, Greek learners of English have a positive attitude towards language learning, but there are also challenges and learning obstacles that can affect their motivation and engagement in the learning process. One challenge is the lack of exposure to native English speakers, which can hinder the development of pronunciation and fluency (Teo & Arkoudis, 2019). Another challenge is the limited availability of English language resources, particularly in rural areas (Papageorgiou, 2019). And, as this study attempts to reveal, the production of accurate language can also, in some cases, prove to be an insurmountable difficulty.

Finally, it would be wise to consider the effect of culture and society upon the learners themselves, since expectations coming from peers and family, as well as exposure to cultural elements and features also seem to be affecting the attitude of learners towards the language they want to learn. In Greek culture, education is highly valued, and proficiency in English is seen as a sign of academic achievement (Teo & Arkoudis, 2019). English is also associated with social mobility (and upward social mobility in particular), and its use is often linked to professional success (Papageorgiou, 2019). As a result, there is often pressure on Greek learners of English to perform well in the language and to achieve high levels of proficiency.

However, there is also a tension between the desire to learn English and the desire to maintain Greek identity and culture (Papageorgiou, 2019). Some Greek learners of English may feel that their use of English could lead to a loss of cultural identity and a distancing from traditional Greek values and practices (Teo & Arkoudis, 2019). This tension can create conflicting attitudes towards English language learning, incorrect and inaccurate conclusions towards the end goals of learning the language and can ultimately affect the motivation of learners to engage in the learning process.

1.3 Organisation of the study

With everything regarding the EFL context in Greece being reported, the next step is to present a plan on the overall structure of this study. It was mentioned earlier in this chapter that Greek learners of English are also struggling with common issues that appear in the existing Second Language Acquisition literature. These issues involve the erroneous acquisition of linguistic features, as well as the persistence of mistakes that are attributed to their first language, Greek, in their English output. By considering the importance of being able to produce error-free language, since Greek people often have to use English in a variety of contexts, the question of ‘how’ they could end up producing more accurate language, while boosting their confidence by making fewer mistakes, started to form in the researcher’s mind.

A variety of studies has shown that the use of technology in a learning environment is often a helpful factor that improves the learners’ overall experience and allows them to perform much better. Since the use of artificial intelligence technologies (AI) has been gradually applied in many aspects and settings of the daily life, including education, the study was designed and conducted under the hypothesis that AI is a tool that can assist Greek learners of English in realising and filling their gaps in language, producing more accurate language and being able to retain that high level of accuracy for a longer period of time.

By taking these points, as well as the problem that inspired this study into consideration, the following research questions were created and created the main body of the research work and the data collection stage. These are the following:

RQ 1: What are the written grammatical errors advanced adult Greek learners of English produce?

RQ 2: What is the learners’ perception regarding producing and correcting written grammatical

errors of English?

RQ 3: Why is it important for adult Greek learners to study English and reach a high standard level?

RQ 4: How effective is the application of computer-assisted and mobile-assisted language learning, including AI apps in correcting advanced adult Greek learners' grammar errors?

The purpose of this chapter was to provide an introduction of the ideas that functioned as the origins of this study. Chapter Two will focus on the presentation and discussion of the various pieces of literature that involve second language acquisition issues, such as fossilisation and the learning plateau. The same chapter will also provide a presentation and a discussion of the various pieces of literature that are connected to the use of technology and AI in education, including the benefits and drawbacks that their use entails. Chapter Three will provide more information regarding the methodology of this study, including the tools that were used, the differences between the pilot and the main study and the steps that were followed during the design and the completion of it. Chapter Four will present the quantitative and qualitative data that has been collected throughout the study, using a series of tables and charts that illustrate the data collected from the participants. Chapter Five will attempt to provide the grounds of a general discussion regarding the findings and what are their implications towards this study. Finally, Chapter Six will function as a conclusion, highlighting the steps that were followed, the difficulties and challenges of this study, as well as future implications and research opportunities that could possibly originate from it.

Chapter 2: Literature review

2.1 Introduction

The previous chapter set the basis of this study. It briefly touched on the importance of learning English in the Greek learning context. This includes a variety of communication contexts, where Greek speakers of English need to contact foreign people using English as a lingua franca. However, as this is common with every speaker of English as a foreign language, many learners are struggling with certain issues that have been identified and discussed in the existing literature. Adult learners of English might be challenged by these learning issues more frequently compared to young learners, as research suggests.

Therefore, this chapter will begin by making a detailed presentation of the interlanguage, the learning space that exists between a learner's first and target language. It will then move on to fossilisation, a phenomenon that emerges within the interlanguage and is responsible for a significant number of mistakes made even by more advanced learners of English. Along with fossilisation, this chapter will also discuss the concept of the Learning Plateau Effect, with an attempt to discuss both the similarities and the differences it shares with fossilisation.

There is no exaggeration behind the notion that this chapter focuses a lot on different aspects of Second Language Acquisition studies. After all, it is these studies that proved to be a source of inspiration behind the conception of this research project. However, this is not entirely true. Since the hypothesis of this research project is about the benefits of using technology (and artificial intelligence-based tech) towards overcoming fossilisation, the remainder of the chapter will focus on examining the merits of technology in learning, hoping that it can prove effective in reducing the number of mistakes advanced Greek learners of English make. It will conclude

with the presentation of theories and studies that focus on the use of Artificial Intelligence (AI) in education, along with their benefits and drawbacks in language learning.

2.2 Interlanguage

2.2.1. A brief introduction to Interlanguage

As one of the most prominent features of SLA studies, interlanguage plays its own special role in the field, with a history dating back to the late 1960s. And while interlanguage is not directly connected with the main research themes of this study, it is a phenomenon that functions as an origin, and an area that is closely related to fossilisation as a linguistic occurrence. It was Selinker (1972) who first discussed it at the Cambridge International Conference, after being influenced by Weinreich (1968) and Lado's work in *Contrastive Analysis and bilingualism* (1957). As a result of this, and over the course of six years, Selinker attempted to further develop the concept of interlanguage by introducing the term *language transfer*. This includes the linguistic components that are transferred from the learners' first language to the target language, as well as any context-bound influences that are connected to transfer (1992). What originally started as research questions asked by Selinker on a language transfer-related research project, eventually led to the study of an entirely new concept, interlanguage, which can be efficiently summarised as a stage of transition, or progression, that exists in speakers of a language who attempt to acquire a new one (Selinker, 1972). Interlanguage embodies phonological, morphological and syntactical features, along with discourse, lexis and pragmatics that appear in both the first and the target language. However, it does not reflect the morphosyntactic structure of the first language (meaning that any first language morphemes used may not correlate or form any meaningful structure with each other) and it does not involve any set of rules evident in the target language.

The hypothesis that the language utilised by second language learners is a linguistic

system that has its own features and is separate from both the learners' first and target languages was originally discussed by two scholars, before Selinker. Corder (1967) called this language utilised by language learners as "transitional competence" and Nemser (1971) referred to it as an "approximative system". It was Selinker though who came up with the term *interlanguage* (1972), a term that is used until today. Since then, researchers in the SLA field have provided their own attempts to define and describe interlanguage. Corder (1981) described interlanguage as an evolving process regarding grammatical rules that learners create in their attempt to properly acquire the actual grammar rules of the language they are attempting to acquire. Stern (1983) tried to classify interlanguage as an independent language variety that has its own rules and perceptions, a notion supported by Richards et al. (1996). Finally, Crystal (2008) seems to be merging different points of view and theories by suggesting that interlanguage is a 'type of language' that does not share similarities to the native language of the learner or the foreign language the learners attempt to acquire.

Interlanguage research has been supported by two different approaches regarding the research on second language acquisition. The first approach is based on the psycholinguistic theories of SLA, which, in turn, are based on Chomsky's Universal Grammar Theory (1959). According to psycholinguists, learners across the globe have an 'innate' ability that allows them to master a second language, or additional foreign languages in the same way they acquire their first language. The second approach is based upon the behaviourist theories of SLA, which focus on the level of interference of the learners' first language, as well as the environment where learning takes place; an approach that is evident in studies, such as Ellis (1985) and Marqués-Pascual (2011). The latter study embraces the second approach, according to which interlanguage is a phenomenon fully associated with the interference of the learners' first language. Interlanguage is the linguistic system that learners develop, which tends to include features of their first language, and attempts to replace them with the target language features, as

they keep acquiring it.

2.2.2 Selinker's Processes of Language Acquisition

Selinker (1972:37) suggests that five important aspects are responsible for shaping interlanguage behaviour and its possible outcomes regarding language production and overall acquisition. These aspects are:

- a) Language transfer
- b) Transfer of training
- c) Procedures of second language communication
- d) Procedures of second language learning
- e) Overgeneralisation of the target language linguistic material

According to Weinreich (1953), language transfer concerns the application of knowledge from the learners' first language to the target language by speakers, and the transfer of linguistic features by writers. This, Selinker suggests (1969), poses a significant problem to linguists, as it involves the possible transfer of structural rules of the learners' first languages into their target languages, increasing the chances of erroneous language acquisition. Odlin, however, describes language transfer as the "influence resulting from similarities and differences between the target language and any other language that has been previously acquired" (1989:27). He even attempts to introduce two different types of transfer. The type of transfer related to the similarities between the first language and the target language (such as similarities in writing patterns, syntax, phonetics or semantics that speed up the acquisition of the target language) is characterised as "positive" (Odlin, 1989:36). On the other hand, the features of the first and the target language leading towards an interlanguage that does not share many similarities with the target language, are responsible for the so-called "negative transfer" (Odlin, 1989:36).

The concept of transfer of training comes next. Selinker (1972) suggests that any mistakes found in the interlanguage stage are the direct outcome of the instruction that has been received in English language courses at language schools. While language transfer is related to the way the first language interferes with the acquisition of the second language via the interlanguage process, transfer of training is related to the actual instruction and the materials used in language acquisition training. Most specifically, Selinker suggests that drills in English language courses, which are based on incorrect language structures, are viable in creating fossilised language patterns that are evident in the learners' interlanguage and result in "transfer of training" (p. 37), whereas Richards (1972) is considering language input in its entirety as a cause for transfer of training, no matter if it is caused by imperfect and incomplete textbook drills, or erroneous instruction and teaching.

As we move towards the aspect of the procedures of second language communication, Selinker (1974) explains that learners often follow specific strategies that will enable them to communicate in the target language they are trying to acquire. However, these strategies are often affected by the learners' cultural background. As he specifically mentions, "Little is known in psychology about what constitutes a strategy, and a viable definition of it does not seem possible at present. Even less is known about strategies which learners of language use in their attempt to master TL and express meanings in it. It has been pointed out that learner strategies are probably culture-bound to some extent" (1974:39). An example that Selinker provides in supporting this statement is about Japanese learners who prefer to ask their colleagues or use a dictionary to search for a word, rather than addressing to the teachers themselves for clarification, the Indian learners who reduce the target language to simpler systems, not to mention the use of chants in traditional cultures as a learning device.

The next aspect, the procedures of second language learning, is an area that generates a

bit more interest. Selinker (1972) discusses that the procedures for learning a second language are detected when the grammatical rules that are displayed in the interlanguage of an individual learner originate from a distinguishable approach by the learner towards the target language. Two basic procedures are involved in the establishment of interlanguage rules: simplification and inferencing.

Regarding simplification, Selinker considers it a prime example of the procedures of foreign language learning and a highly important strategy that enables learners to resolve any communication and learning problems they are facing at a given point in their language acquisition process. Learners who dabble in simplicity often try to make their tasks easier to learn and communicate in a foreign language. Japanese learners who attempt to omit articles or use plural forms as singular, Russian learners who avoid grammatical formatives, such as articles, plural forms and past tense forms (Coulter, 1968), or even Greek learners who prefer to use Present Tenses in order to talk about how long something has been taking place (Papaefthymiou-Lytra, 2001) are good examples of learners who follow this particular strategy, as they try to reduce the target language by omitting the smaller components, details and aspects of the target language and try to focus on the major linguistic features of that language. Ellis (2015) seems to suggest that simplification is none other than the situation when the learners try to limit the range of hypotheses formation, in order to make the process of communication easier in the interlanguage period. By limiting their hypotheses formation, learners of a language tend to perform strategies such as insertion, addition, substitution, or even omission of linguistic components. Of course, it should be emphasised that learners of a second or an additional language attempt to use the strategies mentioned above to simplify and improve the learning process, not to radically change the entire system of the target language they are trying to acquire. Even in controlled learning environments, such as a young learners' classroom, educators might simplify the language learners just to communicate with their students in a way

that is more efficient and approachable for the learners. That, according to Mahmoud, is an approach known as *linguistic simplification* (2014: 279b).

As far as inferencing is concerned, Ellis (2015) connects that with the input learners receive; he seems to believe that inferencing is the outcome of when learners of a second or an additional language form linguistic hypotheses by focusing on the input, rather than trying to simplify the language forms. Ellis is also associating inferencing with Krashen's Input Hypothesis (1985), according to which "if the input is understood and there is enough of it, the necessary grammar is automatically provided" (p.2). He also refers to Shook's study (1998), in which American learners of Spanish were able to notice and comprehend certain linguistic features of Spanish in an enhanced type of input (text with specific grammar forms), without having to attempt to simplify any of them.

The final aspect involves the overgeneralisation of the target language's linguistic material(s). Overgeneralisation is a term that describes the learners' tendency to use already acquired knowledge during the interlanguage stage, in order to fill in the blanks in other rules of the target language. As Jacobvits (1969) more accurately explains, learners of a target language are attempting to apply what they have already learnt and use it in new situations within the target language context. However, overgeneralisation is not always helpful; sometimes it might lead the learners to make and repeat mistakes. Some good examples of this include the use of the third person singular '-s' suffix in verbs following modal verbs (he can plays), or the use of the same suffix in continuous/progressive forms of the verbs (*he is playings). This happens because the learners have understood the rule of the concordance of the suffix -s with third-person singular subject pronouns (he, she, it), but forget not to apply the rule when they use modal verbs (since modal verbs are followed by an infinitive form) or an -ing form, a trait also appearing in Greek learners of English (Papaefthymiou-Lytra, 2001). It could also be said that

over-generalisation can be connected to linguistic simplification strategies utilised by learners, such as the omission of specific linguistic elements. Contrary to the examples mentioned before, the omission of the third singular suffix “-s” (he play the piano) is a good example of simplification and is connected to the overgeneralisation of the rule that verbs in Simple Present form, other than the third singular person, do not have any suffixes. These are mere examples of how small, erroneous instances of language can keep repeating in the interlanguage, occurring to the emergence of fossilisation – a major topic of research, and a pillar of this research project.

Throughout interlanguage studies, the notion of fossilisation plays an important role, with each characteristics and features playing a major role in this study. According to Selinker (1992:209), fossilisation is none other than “the cessation of interlanguage learning, often far from target language norms, and often shown by the failure of learners to acquire a feature where a particular target language feature is expected.” For him, fossilisation is a linguistic phenomenon, including a variety of features such as linguistic rules, linguistic items and subsystems of a first language, whose speakers insist on maintaining during the interlanguage stage and applying in their target language, regardless of the learners’ age or level of instruction (1972). The five Processes of Language Acquisition discussed in Section 2.1.2 are, in a way, responsible for fossilisation, as they encompass a peculiar system, which stores fossilised features in the interlanguage and allows learners to return to them and apply them when it is impossible to produce something in the target language using its own system rules. Consequently, learners tend to fossilise errors or even correct forms of a target language. According to Ellis (1985), who also embraces this notion, fossilisation of correct forms can occur when learners have a specific form in their interlanguages that is similar (but not identical) to a target language form, and fossilisation of errors can occur when an interlanguage form does not have a similar form in the target language. Of course, there has been extensive research on fossilisation ever since, with attempts on defining it on a more accurate level, and a bigger array of factors that might be responsible for the fossilised transfer of language, which will be further explored later – chapter

2.2.1 provides a list of some of the more prominent factors that are responsible for the emergence of the phenomenon.

2.2.3 The Revised Interlanguage Hypothesis

Since its original conception in 1972, interlanguage has both had an impact on second language acquisition studies and evolved in different ways (Han & Tarone, 2014). The revised approach to interlanguage (Revised Interlanguage Hypothesis) has been made by studying cases of fossilised language that is not exclusively restricted to adults, along with the role of universal grammar. More specifically, children who received input in a native language that was different than their own, and refused to respond in the target language, tended to present fossilised forms in their own interlanguage, even though this was thought to be the case with adults. While considering the concept of universal grammar (the notion that all language learners are able to apply similar grammatical rules in their linguistic output, regardless of what language they learn) Selinker (1972) refused to give interlanguage a natural language status. The reason for this is that natural languages are produced by universal grammar, but interlanguages, due to the fact that they are fossilised, are considered to be a product of cognitive processes, rather than the outcome of universal grammar. However, Adjemian (1976) is against Selinker's notion, by suggesting that interlanguages *are* natural languages and products of the universal grammar, even if they can be affected by both the first and the target language; regarding fossilisation, he suggests that it only occurs when there is an enormous gap between parameters set for the first language and parameters set for the target language.

More recent research has revealed another theme that contributes to the revised interlanguage hypothesis: social contexts. Selinker & Douglas (1985) have discovered that social contexts can change the sequences of linguistic development in second language acquisition; for instance, international teaching assistants might be more fluent while producing language that is

connected to their field of interest, rather than language that is used to buy something from a store. Tarone (2000) and Geeslin & Gudmestad (2010) suggest that, since factors such as task, topic or social context can cause different forms of variation in interlanguage, researchers ought to document these factors and use different tools to redefine and remodel interlanguage. Fasold & Preston (2007) present a psycholinguistic model that tends to explain how bilingual speakers utilise their linguistic systems to respond in different contexts, while Rampton (2013) expands on this idea and proposes the comparison of the use of interlanguage between bilingual and monolingual speakers, along with the investigation of how linguistic notions developed by monolingual minds can be extended to bilingual minds as well.

Therefore, it is evident that research on interlanguage entails more factors, compared to the original focus on lexis, syntax, morphology and phonology. The initial interlanguage theory was the trigger that expanded the research on second language acquisition. And it is this research that has inspired the studying of fossilisation, as it is a phenomenon closely related to interlanguage. Both in the original and the revised interlanguage hypothesis, there have been many attempts to describe the actual phenomenon and explain its origins; the findings are interesting and will be adequately presented in the following section, since fossilisation is a central pillar of this particular research.

2.3 Fossilisation

2.3.1 Section Overview

Fossilisation is among the most interesting areas of second language acquisition studies. It is a phenomenon that attempts to create the connecting link between the successful acquisition of a target language and the mistakes that occur long after the acquisition of that language. Fossilisation is a recurring phenomenon that many studies have attempted to investigate and

explain but is still a matter of investigation and debate among researchers.

Section 2.3 attempts to establish a solid knowledge and understanding of this phenomenon. Since the present study attempts to investigate the possibility of the correction of errors that keep emerging in the linguistic output, it would be wise to proceed with a detailed discussion of what fossilisation is and how it has been approached by researchers and studies throughout the years. The chapter begins with an introduction to the phenomenon, and how this connects to interlanguage. It then considers the frequency of its emergence among learners of different ages and attempts to explain why this is happening, using existing sources. Next, it moves to present the different aspects of fossilisation, and the way they have been documented over the years and by different researchers. Moving on, the chapter will present the theoretical background of fossilisation. This is a compilation of different theories that attempt to explain not only the reason why fossilisation occurs but also why it becomes solid in the interlanguage. It will present a number of features and linguistic items that are more susceptible to fossilisation, along with the reasons why some learners are more likely to develop fossilised patterns in their interlanguage, compared to others.

More importantly, though, it will attempt to make a connection between fossilisation and the Learning Plateau Effect, which is another concept of high interest – one that is often associated with fossilisation itself. The literature that has been used will provide the similarities and the differences between these two phenomena in a clear way, while at the same time, it will reveal some strategies that can enable learners to overcome them and proceed to the successful acquisition of the target language. This is also a key aspect of the study, one that links to the methodology and what was ultimately expected from the participants.

2.3.2 An introduction to fossilisation

As previously discussed, fossilisation is a term coined by Selinker (1972), in order to describe the cases of students who maintain linguistic features of their first language during the interlanguage process and attempt to apply them in the language they are trying to acquire. Originally, talks about fossilisation involved being an issue that appears in within the concept of interlanguage, the main focus of Selinker's research. However, a few years later, even Selinker himself gave credit to this issue, by suggesting that fossilised phenomena are all the linguistic features, rules, subsystems and patterns that are encountered in a learner's first language. These are carried over in the interlanguage to maintain a level of relativity and connection with the first language and stay there, no matter the age of the learner, the amount of instruction and the input they receive in the target language. Long (2003) attempts to make a different approach to the phenomenon, by questioning whether fossilisation is a characteristic that also occurs in children's second language acquisition, and not only in adults, thus attempting to examine the phenomenon through a different angle. He recognises, though, that there are not many empirical studies that can show whether fossilisation actually occurs in young learners who learn a second language. Even though he cannot be ultimately sure about fossilisation in children's second language acquisition process, he does believe that it is possible for children to master a target language if they are exposed to opportunities that can help them assimilate its features. Al-Shormani (2013) makes an effort to provide a simpler definition of the phenomenon, by suggesting that fossilisation is but a mere feature of second language acquisition, and the one that draws the line between first and second language acquisition.

At this point, it is evident that fossilisation and interlanguage are two concepts that share both similarities and differences. Interlanguage is the transitional linguistic system that learners create during the process of second language acquisition. On the other hand, fossilisation refers to the permanent cessation of interlanguage learning before the learner achieves the target

language forms and structures across linguistic structures and discourse domains (Rustandi et al., 2023).

One similarity between these two phenomena is that they are intertwined, interconnected concepts. Interlanguage is closely related to fossilisation, with the latter being a defining characteristic of second language acquisition (Chen & Zhao, 2013). However, regardless of their close relationship, an important difference exists between them; one that is more closely attributed to their nature. Fossilisation represents a stage where the acquired language ceases to develop and solidifies into the interlanguage, stopping the progress towards native-like proficiency (Vavilova & Broadbent, 2019). Contrast to this, interlanguage is a dynamic system that learners construct as they progress towards target language proficiency, the existence of which cannot be affected by the emergence of rigid linguistic occurrences (Chidi-Onwuta, 2022).

There is a reason why research throughout the years has focused so much on the significance of the ways language acquisition is fully achieved, regarding fossilisation. According to Ingram (1999), children are in a position of acquiring and applying their first language within a period of two to three years after birth by moving through different stages – from uttering simple words to producing complex sentences. Ellis (2008) uses the data from studies made by Hakuta (1976; 1986), Okuda (1987) and Saville-Troike (1988) to present the developmental stages of children's acquisition of language. The first stage is called the silent period; this is the stage when the learner does not produce but processes the features of the language that is used. The second stage is known as the production of formulaic speech stage. This is when the learner uses fixed expressions related to specific pragmatic contexts, often learnt as chunks. The final stage is the structural and semantic simplification of early creative utterances stage; this is when the learner omits certain linguistic features, due to the lack of

access to, or acquisition of, certain linguistic forms. The fact that children have to produce language in order to communicate with members of their family and their wider social circle results in constant exposure to their first language and its grammar, leading them to fully acquire and use even the most challenging features of their first language until the age of six.

It is true that there have been incidents throughout human history where children were not able to effectively use their first language. These cases of “wild children” (Curtiss, 1977) had little (or no) exposure to language due to neglect and had to go through interventions, with varying levels of success. In cases of children, however, without any specific cognitive difficulties, the acquisition of the first language is successful. They manage to acquire the lexis and the grammar of the language they are exposed to during the early days of their lives and succeed in using it effectively. Ellis (2008) suggests that children who learn a second language go through the same acquisition stages as in their first language; while it might take a longer time, compared to their first language, children manage to successfully acquire a second language as well. And since the acquisition of a second language can be successful with children, there is no need to present any additional studies or sources to debate over it.

However, even if the children’s second language acquisition can be quite a wonderful occurrence, with high rates of success, the same cannot be said about adults’ second language acquisition process. Lots of studies suggest that most adults who attempt to learn a second language never seem to reach a native-like mastery of the foreign language, unlike young learners. Looking at the literature, it is observed that Kellerman (1984) attempts to discuss the difference in complete mastery of a second language between young and adult learners. Birdsong (1992) admits that adult second language acquisition results in varying degrees of success, while failure to acquire the target language is quite typical. Schachter (1996) suggests that most adult learners are not able to achieve the same level of mastery as the one achieved by

a child learner. Schwartz (1997) discusses this further, by saying that age is an equally important factor; compared to childhood, it is much harder to learn a second language in adulthood. However, he goes on by saying that this development can be *fossilised* into permanent error patterns that cannot be undone by any teaching or correction. Abrahamsson & Hyltenstam (2008) accept that learners who begin to learn a language during childhood, end up acquiring the language; they admit, though, that the differences which define the rate of acquisition of a language between children and adults can “be attributed to social, psychological and educational factors” (p. 482), and that even adult learners might have the aptitude to acquire a high level of second language acquisition mastery. This gap in language acquisition can be better observed in people who decide to leave their country of origin and move to a new place. Lightbown & Spada (2006) believe that young immigrant children manage to speak the language of their new community (both inside and outside school) with the same fluency and competence as local people do, but such a level of mastery cannot be easily achieved by their parents. This statement though, seems to be invalid, according to DeKeyser (2013), whose research showed that immigrant children might not be learning as fast as it was originally estimated, but they keep learning until they reach the level native-speaking children of their age have. Finally, Fromkin, Rodman & Hyams (2017) believe that, while there are exceptions, adult L2 learners often make mistakes in syntax or morphology; mistakes that are not encountered in children. In addition, adult L2 learners fail to acquire competence in pronunciation (thus explaining the existence of “accent”).

These pieces of work, along with other additions in the relevant literature, such as Selinker (1992), Scovel (2000) and Han (2004), seem to agree that only a few L2 adult learners manage to achieve a level of proficiency that can be considered native-like when compared to young learners. As it was discussed earlier in the chapter, there are various factors that may contribute to this gap. There might be motivational reasons (Dornyei, 2007), or linguistic

aptitude reasons (Carroll & Sapon, 2002). In SLA, however, age is a key factor. Towell & Hawkins (1994) believe that the learning of a second or additional language after the age of 10 can not only be a difficult and long process but, in some cases, be responsible for a halt in obtaining native-like proficiency in the language. This halt, this obstacle, is what led Selinker (1972) to coin a term that would pass down in literature, and become an object of extensive research in later years; fossilisation. More specifically, he tried to describe fossilisation as a concept that has a dual nature. It can be a cognitive mechanism (related to the ability learners have in acquiring a language), and a performance-related phenomenon (related to how effectively elements of a first language are removed during the process of second language acquisition). Lowther (1983), O'Grady, Archibald & Katamba (2011) also embrace the idea that fossilisation is the ability of interlanguage, "the idiolect developed by second language learners that maintains some first language" (Selinker, 1972), to change. This happens because sometimes the interlanguage might keep elements of the L2 learners' first language(s), and lead them into making lexical, morphological and syntactical errors, without them changing into the correct L2 forms.

Interlanguage seems to be well-connected to fossilisation, particularly when it comes to the transfer of various linguistic elements from L1 to L2. Ellis (1985) explains this connection in his work, by suggesting that fossilisation is a standard phenomenon in Second Language Acquisition, and can have positive or negative outcomes, when it comes to the successful transfer of elements of the first language that might be similar to elements of the target language, during the interlanguage stage. Hyltenstam (1988:68) maintains a similar point of view in his work, by suggesting that fossilisation is "a process that may occur in the Second Language Acquisition context, as opposed to first language acquisition". In his work, Hyltenstam stresses the influence of the learners' first language. He talks about features of the first language that often reappear in the learners' speech, even if they seem to have disappeared during the second

language acquisition process.

Before moving to the next part of the section that provides more information about the different aspects of fossilisation, it would be wise to mention another interesting point in SLA studies.. More specifically, the restricting feature of SLA, called the plateau effect by Richards (2008), who defined this phenomenon as a temporary hiatus that occurs when learners move from intermediate to advanced learners. According to Richards, when second language learners are learning second language structural rules and concepts, there will come a time when they hit a plateau where they can no longer make noticeable progress. Several researchers (Richards, 2008; Long, 2003; Yi, 2009) suggest that, when reaching the learning plateau, it is likely that learners are able to make progress; however, under certain conditions, they will never make the progress they want, despite the amount of effort they devote to it. This can be a very frustrating experience, and unfortunately, most L2 learners stop learning when they reach this stage; few learners continue learning, especially those who are exposed to certain pedagogical approaches and effective learning strategies. It is quite an interesting phenomenon, that has partly influenced the objectives of the study and the collected data, and will be discussed later in this section, starting at 2.3.4

2.3.3 The different aspects of fossilisation

So far, research has accounted for four different aspects of fossilisation, as they are summarised in Al-Shormani (2013). These aspects are based on different eras and approaches to the phenomenon, and describe:

- a) **Fossilisation as permanent transfer** (Weinreich, 1953).
- b) **Fossilisation as permanent intermediate systems and subsystems** (Nemser, 1971).
- c) **Fossilisation as the manifestation of difficulties in L1 parameter resetting** (Hale, 1988)

d) **Fossilisation as the product of the Multiple Effects Principle**, involving ‘transfer’
(Selinker & Lakshmanan, 1992)

The first aspect was developed at a time when the Contrastive Analysis Hypothesis was the epicentre of linguistics-based research, with many researchers attempting to investigate the first language interference in the mistakes made in the target language. Weinreich (1953) approached fossilisation with a mindset of studying it within a structuralist/functionalist framework. The second aspect was developed at the twilight of the CAH era when the analysis of errors was starting to attract the interest of researchers. It was the time when mistakes moved from being the negative manifestation of the part(s) in the learning process that must be dealt with effectively, to be the concrete proof that target language systems are being assimilated in the learning process while the learner follows an appropriate system of rules. The third and fourth aspects are of particular interest, in the sense that they originate from completely different fields. While Hale’s approach towards fossilisation has been made within the framework of Chomsky’s Universal Grammar theory, Selinker & Lakshmanan attempt to deal with fossilisation from a unique, pedagogical perspective, one that tries to encompass the values of the Universal Grammar theory and any contextually-oriented language acquisition features that fossilisation might have. Additionally, Selinker & Lakshmanan (1992) maintain the assumption that the notion of transfer affects fossilisation, no matter whether it happens implicitly or explicitly, and it is common in all the aspects presented before. The assumption (either implied or clearly expressed) that a learner tends to acquire target language forms due to the transfer of elements from the first language, is also a common point of view among these aspects.

According to Nakuma (1998), Weinreich’s explanation of ‘permanent grammatical transfer’ as a means to explain fossilisation, originates from the belief that first language features might be incorrectly associated with target language features, leading the learners to assimilate them in

their interlanguage, thus leading to stabilization and, consequently, to fossilisation. Nemser's approach to fossilisation as permanent intermediate systems also has its flaws. While this approach has similar traits to Selinker's notion of interlanguage, in the sense that it is a distinct level of linguistic operations, different from both the first language and the target language features, it does not seem to reach the same conclusions. In Nemser, the learners' permanent intermediate systems never get to reach the target language features, and the learners never get to attain a level of competence similar to that of the target language speakers; since the intermediate system is 'permanent', then the inability to attain native level competence is, by extension, permanent, and very similar to the way fossilisation operates. Furthermore, Hale suggests that fossilisation could be the outcome of "certain L1 parameter settings [that] may be extremely difficult to eradicate from acquired L2, at least at the level of integrated linguistic competence, as opposed to a conscious intellectual understanding of surface grammatical facts." (1988:32). Since his approach is based upon the principles of the universal grammar theory, he believes that fossilisation occurs as a result of universal grammar features not being present within the learners. Finally, Selinker & Lakshmanan (1992) build their approach towards fossilisation upon their multiple effects principle framework, according to which when two or more second language acquisition factors operate alongside each other, interlanguage forms are more likely to stabilise and, therefore, to fossilise.

2.3.4 The theoretical background of fossilisation

As discussed before, Selinker (1972) added the concept of fossilisation in Second Language Acquisition studies to explain potential difficulties that occur in the interlanguage and all the processes that describe the transition from the first language to the target language. Over the years, researchers such as Adjemian (1976), Corder (1971, 1975), Nakuma (1988), Nemser (1972), Schumann (1978, 1990) and Selinker (1972, 1992, 1993) have tried to provide a clear framework upon which they can fully explain the phenomenon. Other researchers have tried to

get into depth with the phenomenon and its various dimensions.

They attempted to investigate;

a) the reason(s) why fossilisation occurs (Seliger, 1978; Stern, 1975; Virgil & Oller, 1976)

b) the conditions that permit fossilisation to solidify in the interlanguage (Schumann, 1978, 1990; Virgil & Oller, 1976)

c) the kinds of linguistic items or features that are more prone to fossilisation (Selinker and Lakshmanan, 1992)

d) the reasons why some learners are more likely to develop fossilised patterns in their interlanguage compared to others (Adjemian, 1976; Scovel, 1969, 1978, 1982, 2000; Virgil and Oller, 1976)

In its early stages of conception and analysis, fossilisation was considered to affect specific parts of the target language grammar, not the entire target language grammar. Selinker (1993) attempted to support that idea by suggesting that fossilisation is a phenomenon that does not necessarily depend on a particular linguistic domain but might be bound to a context. Long also supported the notion of context, by considering fossilisation to be a “fluctuation...across contexts, not just by uniformity in performance across all contexts, and was meaningfully sought under conditions of natural exposure, that is, in second, as opposed to foreign, language settings” (2003: 372).

It seems though that the notion of ‘context’ is still something that is under consideration and debate. Long himself (2003) suggests that it is something quite difficult to conceptualise and manage to successfully work on. Therefore, it would be wiser to suggest that the idea of ‘context’ is something that is different among individual learners and might relate to different stages of their learning process. In that case, fossilisation might appear as a fluctuation in the overall interlanguage performance and development, in the sense that some target language

features might appear correctly in some areas, and incorrectly in others. This fluctuation in the development of the interlanguage and the acquisition process of the target language is, most probably, persistent. It appears for an extensive period of time and does not seem to be affected by any amount of instruction, or exposure to the target language in an environment where that language is spoken natively (Long, 2003). It should be stressed, though, that this fluctuation should not necessarily lead to fossilisation. In order to be more accurate, Long (2003) suggests that any fluctuations should be examined by taking both cognitive factors and input methods under consideration; after all, there is always the case where learners might show evidence of fossilised forms in their output as a result of missing ambiguous, unclear or not widely used pragmatic features of the target language during instruction, especially in cases of learners who are not able to notice these gaps immediately.

The existence, persistence and perseverance of fossilisation might be subject to other factors as well, such as social, effective or cognitive factors. Some interesting examples in literature further support this notion. Schuman (1978) presented the findings of an interesting case study. The subject of this study was learning English as a foreign language in a native-speaking context, along with other members of the class. The subject's output was monitored constantly, in a variety of settings and with a myriad of different tools. While it was found that the other members of the class were able to successfully acquire the language, the subject of the study was not able to progress in a similar manner. Instead, the subject was shown to develop a variety of language that seemed to be more similar to a pidgin variety of English. It was discovered that the subject did not consider improving their language skills as important, since communication with other English-speaking people was unobstructed. In Schuman's study, the subject's speaking and writing skills were quite limited; still, the subject felt more than happy with their current level of their interlanguage, without considering making additional effort to improve it. This behavioural approach to learning and fossilisation might also relate to how

learners around the globe approach the target language and to what extent the learning context and their personal attitude might affect learning. As in the example of the case study, learners who are exposed to a learning context that is not only communicative, but also affective and formative, and have a negative attitude towards the target language, are then expected to showcase extremely high levels of fossilised patterns in their output.

Han (2004) also seems to acknowledge these factors. Additionally, she mentions another factor that intertwines with those mentioned before, one that might be playing a role in how fossilisation works. She suggests that, for every learner, there is a sensitive period of learning, a concept that is similar to Lenneberg's Critical Period Hypothesis (1967). According to Han, the sensitive period greatly affects the way fossilisation occurs. Once learners of a second or additional language move beyond the sensitive period, their sensitivity to second language input decreases and their ability to fully benefit from exposure to the target language diminishes. Therefore, incorrect fossilised patterns of the target language are expected to remain in the learners' interlanguage permanently, and cannot be easily removed, or restricted. To fully explain her idea, Han presented an interesting example of how fossilisation can remain stable. She was inspired after reading the obituary of a renowned Chinese professor, who had a brilliant academic career in the United States. The professor was born and raised in China and only moved to the United States as an adult. Despite having made important advances in her field, the professor struggled with her English language skills until the end of her life. Most of the time she tended to speak a variety of idiosyncratic English, despite her efforts to improve her spoken English. According to Han (2004), long exposure to the target language and constant efforts to improve the target language skills might not always lead to the desired state of mastering the target language. Erroneous, fossilised patterns might always be there. Of course, she notices that an adequate amount of input, sufficient opportunities to practice and high levels of motivation might be enough for a learner to progress.

Eventually, this might mean that fossilisation might not be completely frozen in the interlanguage, and interlanguage development might not have to cease. This statement also signifies the main difference between fossilisation (which is more stable and permanent) and the Learning Plateau, which can be overcome and will be discussed in the following segment of the chapter. It should be noted, though, that there is little research so far on the extent of preventing or overcoming fossilisation and/or the Learning Plateau. There is also not significant (or more recent) research that investigates the way some learners have managed to overcome one or more areas of their interlanguage that remain stable and unchanged, such as those learners who manage to achieve a high level of linguistic mastery, yet were struggling with fossilised patterns in their interlanguage development at any given stage (e.g. Acton, 1984; Birdsong, 1992; Bongaerts, 1999; Ioup, et al, 1994; Mizuno 1999).

The notion of the sensitive periods in learning is something that is also embraced by Long (2003). In this regard, Long ascertains that the timing of the sensitive periods is the key to fossilisation. Specifically, any children who are exposed to features of the target language “before the offset of one or more sensitive periods for language development can reach native-like levels, whereas those exposed later cannot” (2003: 374). He even expands this train of thought, by attempting to investigate the extent of the occurrence of fossilisation, the areas of the language that are expected to be affected by fossilisation, as well as the causes that trigger the emergence of fossilisation in specific linguistic contexts. As a result of all these questions, Long (2003) also attempts to underline the challenges that teachers and potential researchers are expected to encounter when dealing with learners. With fossilisation being considered to emerge at some point during the learning process, Long invites teachers and researchers to pick areas of the interlanguage, such as linguistic rules, words, meanings, relationships of form and function, and collocations among others, in order to decide whether they do hold some merit in further

analysis. However, he does understand that providing answers to his queries is not viable, and it should be the focus of future research projects and theoretical backgrounds.

Al-Shormani (2013) discusses some of the questions that Long (2003) has considered in his work: the linguistic domain of the target language that is more likely to fossilise first, and the extent of fossilisation regarding younger and adult learners, in connection to target language mastery. The first question has, in fact, been answered by previous researchers; Selinker (1972, 1992, 1993), Han (2000, 2004), Mitchell & Myles (1998), White (1996, 2003) and Goad & White (2006) have concluded that the domain to be affected by fossilisation first is phonology and pronunciations. Additionally, Fidler (2006), Goad & White (2006), Han (2003, 2004), Mitchell & Myles (1998), and White (2003), have observed that learners, who do not succeed in acquiring the target language completely, do so because of a stop in their interlanguage, which might be connected to the Learning Plateau hypothesis. Mitchell & Myle's approach to this is equally interesting from a research perspective. By considering that second language acquisition for adult learners is never as successful as that of young learners, they attribute this difference to the existence of two different explanations: the psycholinguistic explanation and the sociolinguistic explanation. The psycholinguistic explanation deals with the fact that language-specific mechanisms that are evident in children, simply "cease to work for adult learners" (p.13). The sociolinguistic explanation presents the fact that adult learners are deprived of social and motivational opportunities that would enable them to be an inseparable part of the community that speaks the target language, forcing them to stay behind younger learners in terms of linguistic competence.

Without a doubt though, research in language acquisition keeps attracting the interest of many researchers worldwide and will continue to do so. According to Long, fossilisation research in second language acquisition "has become widely accepted as a psychologically real

phenomenon of considerable theoretical and practical importance.” (2003:171), and investigating all these factors that differentiate adult learners from young learners will require more research, more effort and more investigations. A good start would be the emergence of more studies that would focus on the aspects of language that tend to be fossilised, so that they could establish a basis for initial discussion. This could also be more relevant to the Greek EFL context. For Greek learners of English, this phenomenon presents unique challenges, such as acquiring knowledge of English phonemes and spelling irregularities, including the representation of phonemes by different graphemes (Kuloheri, 2014). Additionally, studies have shown that native language influences the production of second-language prosody, as evidenced by the transfer effects observed in Greek learners of English (Kainada & Lengeris, 2015). Other than these, though, no significant steps have been made in this regard, and there are no studies looking to address this issue with adult learners of English. Therefore, the present study will attempt to further close the gap on fossilisation-related aspects in the Greek context by adding more concrete examples that could determine the emergence of fossilised patterns in adult learners.

2.3.5 A primary discussion of the Learning Plateau Effect

While the connection between fossilisation and interlanguage is evident in literature, the research that has been conducted until now does not seem to reach common ground on the causes and aspects of the phenomenon. In fact, while researchers acknowledge the existence of fossilisation in second language acquisition studies, they are not able to accurately analyse it, or study it in depth. Due to its wide range of effects and variables, there are not enough empirical studies and research projects that can further back up an attempt to finally define the nature of fossilisation. Gregg (2003) has rejected the existing attempts to provide some accurate definition since the way fossilisation works is not clearly understood, and not satisfactorily explained. Han (2004) has attempted to provide a definition for the phenomenon in a relatively simplified way.

She suggests that fossilisation should be approached and examined through two different angles, or levels: the cognitive level and the empirical level. At the cognitive level, fossilisation occurs because of cognitive mechanisms that tend to produce permanently ceased forms of interlanguage. At the empirical level, fossilisation occurs because of these permanently ceased forms that remain in the produced language irrespective of source(s) or ways of acquisition and study. This is an approach that tries to cover a wide spectre of the phenomenon as plainly as possible, and thus might not be enough to properly define and explain it. As Han herself admits (2003:119), fossilisation “remains an SLA conundrum”, possibly due to the inability among researchers to reach a consensus.

Undoubtedly though, research has shown again and again that elements of the language, which are created in the interlanguage and should evolve -or disappear, eventually remain present and frozen. Starting with Richards (2008), more recent studies have placed the inability to progress under the umbrella of the *plateau effect*. In his study, Richards (2008) explains that the plateau effect is none other than a stop in the linguistic progression of a learner between intermediate (B1 and B2) and advanced (C1 and C2) levels. This stop occurs naturally, within the context of learning, and it might not allow learners of the second language to make significant progress in language acquisition. The plateau effect can be observed more frequently among advanced learners, who are attempting to learn more sophisticated and advanced rules and concepts. In this case, learners that reach the learning plateau might be able to make some progress, a fact that completely contrasts the actual nature of fossilisation, which does not permit the learners to see a significant amount of development and linguistic competence. As a result of this, learners might often feel frustrated and disappointed – and these negative feelings might be the actual reason behind that block in the learning process. Wei (2008:127) further expanded on Richards, by classifying fossilisation into two distinct groups; *error reappearance* and *language competence* fossilisation. The former seems to appear in learners with extremely low levels of

linguistic proficiency, while the latter seems to involve learners whose learning development has reached a plateau, i.e. a high level before stopping due to unforeseeable reasons.

Regarding the plateau effect, recent studies (Long, 2003; Richards, 2008, Wei: 2008) suggest that it can be overcome. This might happen due to extremely high motivation levels from the learners themselves, or through a series of specific pedagogical strategies, procedures and techniques that need to be followed both by the learners and their instructors. Richards (2008) suggests three main techniques for teachers that can help their learners overcome this learning obstacle. These are:

- a) The incorporation of a more explicit treatment of grammar within the curriculum.
- b) The building of a focus on form into teaching through the use of activities that centre on raising the learners' noticing skills and a deeper understanding of grammatical features that occur in input and output.
- c) The more extended use of activities that require 'stretched output' (2008: 21). This has to do with expanding, or even recreating, the learners' grammatical systems through increased-difficulty communicative tasks and tasks that require attention to form.

Richards' suggestions do not focus solely on teachers. There is also a series of techniques that are perfect for the learners themselves and can be quite effective if the learners actually pay attention to them and try to master them. These include:

- a) The expansion of their grammatical competence by incorporating new ways to use known forms of language, and by acquiring new ways to add more advanced and complex linguistic features into the pool of available language resources.
- b) An effort to become more fluent and accurate users of the target language.
- c) The development of their ability to successfully monitor their own language production as well as that of other learners and notice the possible gap that might exist between their

output capacities and that of the more advanced learners of the language.

- d) An attempt to keep developing their vocabulary, to the extent of building an inner vocabulary pool between five to six thousand words.
- e) The development of a greater awareness of patterns in lexis (collocations) and the effort to become more familiar with them.
- f) The mastery of oral drills and other conversational routines in order to ensure more active participation in conversation and other types of spoken discourse.
- g) The additional development of their proficiency in their listening, reading and writing skills.

Later, Yi contributed more to this list (2011:157-161) by making the following recommendations on the matter:

- Providing input that is comprehensible, interesting, relevant and authentic.
- Providing instruction that offers ample opportunities for practice and exposure.
- Providing output that is correct, meaningful, appropriate, and effective.
- Designing curricula and syllabi that focus on the learners' needs.
- Teaching materials that develop the learners' communicative competence.

By taking these studies into consideration and looking at other, relevant studies (Utegulova., 2022), it is inferred that the learning plateau is a stage in the learning process where a learner's progress temporarily stops, indicating a period of stability in any forms of linguistic acquisition – a concept that is supported by the author of this study. The temporary stop is what differentiates the learning plateau from fossilisation, which is characterised by a permanent stop in language acquisition. In addition, this constitutes the main difference between the learning plateau and interlanguage. While the learning plateau signifies a temporary halt in progress, interlanguage is a continuous and evolving process influenced by various factors such as

teaching methods, social contexts, and individual learning strategies (Chidi-Onwuta, 2022). Of course, the fact that learning methods, tools and strategies can assist in the continuation of the learning process could indicate that the learning plateau and interlanguage might not be completely different, after all. And linking into this study, it is the implementation of technology as a learning tool that could test if the participants can continue learning, or succumb to a more permanent cessation, under the guise of fossilisation.

2.3.6 The nature of fossilisation and the conditions of its emergence

Fossilisation, as a phenomenon, is approached in a different way, resulting in different conclusions from researchers. However, as it has been mentioned before, the big issue with fossilisation is not its existence, but rather the nature of its manifestation. Ellis specifically says that “fossilized structures can be realised as errors or as correct target language forms. If, when fossilization occurs, the learner has reached a stage of development in which feature X in his interlanguage has assumed the same form as in the target language, then fossilization of the correct form will occur. If, however, the learner has reached a stage in which feature Y still does not have the same form as the target language, the fossilization will manifest itself as an error” (1985:48). Han (2004) accepts that, upon observations, fossilisation is a phenomenon that occurs within a second language acquisition context. It deals with target language features found in the learner’s interlanguage, whose development has ceased, and does not relate to the learner’s target language. It is also possible that fossilisation might be caused by linguistic elements that have been long left behind, and for some reason, they choose to resurface and be used in the learner’s output. In this case, it is safe to assume that the learner has returned back to previous levels of linguistic attainment and has probably stopped learning.

In addition, Han (2004) moves on to identify two types of fossilisation. The first type, called local, describes the cases when fossilisation occurs at a structural level. The second type,

called global, describes the cases when fossilisation affects the overall level of competence and attainment for learners. For Han, local fossilisation seems to be the norm, the one occurring more frequently; and since local fossilisation is the norm, it also confirms the theory that certain elements of the interlanguage are more susceptible to interlanguage than others. This, in turn, also confirms that fossilisation does not affect the learners' grammar in its entirety, but rather a part of it; and this is the reason why some linguistic features that are cognitively difficult to embrace, or have no communicative merit, are the ones that fossilize earlier than other features do. Han (2004) also suggests that each type of fossilisation has three different sides: the cross-learner variation, the inter-learner variation, and the intra-learner variation. Due to this fact, fossilisation should be scrutinised at a macroscopic level (cross-learner variation) and a microscopic level (inter- learner and intra-learner variation). Depending on the type and side of fossilisation, a careful analysis might be able to provide some insight into the different amounts of fossilised interlanguage features, and the reason why some learners might achieve better attainment levels, compared to others. She maintains that the first language influence and the critical period might be the factors associated more with the macroscopic level, whereas the learners' sociocultural background, their prior experience in learning languages other than their first, the learning environment, the exposure to input and their own processing styles might be those factors closely related to the microscopic level. Long also seems to embrace this point of view, by suggesting that any research-related tools that have relevance to fossilisation, including research plans, measurement criteria, subjects and collected data, vary at a considerable level (2003). For Long, all the explanations that attempt to describe and analyse fossilisation should treat it not as a procedure, but as an outcome.

Summarising from before, it has been suggested that fossilisation does not affect the entire language, and cannot fully obstruct a person from the learning process. However, as it is already mentioned, fossilisation is not something that can be fully avoided and cannot be

completely and properly defined. These assumptions are responsible for raising two issues for further deliberation. The first one deals with the fact that there is no unanimous agreement on how fossilisation should be approached and studied. The second one reminds us that there are not enough empirical studies that can provide a more accurate description. In addition, most of the attempts to study and analyse the phenomenon are made with the assumption that adult learners fail to attain linguistic mastery of their target language, a fact that completely contrasts the ability of younger learners to acquire a target language at a native-level of mastery (White, 2003).

Han's classification of global and local fossilisation, which shows how fossilisation can move from affecting the entire interlanguage to affecting specific parts of the interlanguage, should also be addressed more carefully through additional research. This is because there are cases of learners that might be expressing progress and cessation of learning at a concurrent level. Filder (2006) presented an interesting case study of a Japanese student of English who showed levels of both linguistic improvement and relapse. As such, Filder recommends that any fossilisation-related assumptions ought to be reappraised and considered from a different point of view so that fossilisation can be analysed and studied from the right perspective. At this stage, research should not focus on proving the existence of fossilisation, but on trying to define the nature, and the interlanguage areas that trigger its emergence. For this reason, Long (2003) has recommended that any researchers who would like to attempt this careful and more considerate analysis should conduct their studies by making observations and collecting data on the same variables over longer periods of time, instead of collecting data at a specific point in time. This type of research can provide enough data, which can lead to making safer conclusions regarding the phenomenon. As such, more longitudinal studies (and not cross-sectional) should be considered in investigating the delicate aspects of fossilisation, and also its relationship with the learning plateau effect, which will be discussed in the following part.

2.3.7 Differences between fossilisation and the Learning Plateau Effect

In the previous section, the issue of the cessation of progress in interlanguage development was briefly touched on, showing that second language acquisition research has attempted to investigate this phenomenon from different angles. Originally thought that fossilisation is the reason for the cessation of learning, efforts have been made to place it into a specific concept again and again. So far, fossilisation has been referred to as **backsliding**, (Ellis, 1985; Schachter, 1988; Selinker; 1972), **stabilised errors** (Schumann, 1978), **persistent non-target-like performance** (Mukattash, 1986), **typical errors** (Kellerman, 1984), **ingrained errors** (Valette, 1991), **systematic use of erroneous forms** (Allwight & Bailey, 1991), **variable outcomes** (Perdue, 1993), **cessation of learning** (Odlin, 1993), **structural persistence** (Selinker & Lakshmanan, 1992), errors that are **impervious to negative evidence** (Lin & Hedgcock 1996), **long-lasting free variation** (Ellis, 1999), **persistent difficulty** (Hawkins, 2000), **ultimate attainment** (Birdsong, 1992), **plateau effect in learning** (Richards, 2008) and **recurring interlanguage forms that should not be always treated as errors** (Al-Shormani, 2013). These recurring forms should, of course, be distinguished from all recurrent erroneous forms that appear in interlanguage, known as **irrecoverable errors**.

It should be noted, though, that any attempt to approach, study and analyse the cessation(s) of linguistic development in interlanguage is a rather daunting and challenging field of research; hence the wide variety of concepts used by researchers up to this point. In the early 1990s, Selinker & Lakshmanan (1992) provided two classifications of fossilisation: **temporary fossilisation** and **permanent fossilisation**. In the case of temporary fossilisation, they assume that stabilization in the learning process occurs due to the existence of plateaus, which attempt to stop, prevent, and slow down the correct development of target language features. However,

permanent fossilisation might be attributed to external factors, such as psychological, or social. Later, Selinker (1993) conceptualised two additional types of fossilisation; **individual fossilisation** and **group fossilisation**. Individual fossilisation deals with the different types of persistent forms appearing in learners' interlanguage, whereas group fossilisation involves the obstacle in the learning development that remains, appearing within members of a learning context for an extended period of time. As it was mentioned previously, Han (2004) also identifies two types of fossilisation: **local fossilisation** and **global fossilisation**. In a similar manner to Selinker's definitions, local fossilisation examines the phenomenon at a structural level, whereas global fossilisation revolves around the level of competence of a group of learners in its entirety. As was also previously discussed, Wei (2008) introduces two other classifications of fossilisation. **Error reappearance fossilisation** addresses the underdeveloped interlanguage structures that should have evolved to target language forms, but, unfortunately, they have not. It is a type of fossilisation that appears more frequently in the interlanguage of learners with a limited or low level of attainment. **Language competence fossilisation**, however, is something entirely different. This refers to the limit learners reach as far as their overall attainment of phonology, grammar, lexis and pragmatical features of the language is concerned. It is a type of fossilisation that appears to learners who have been learning a language for a big period of time, have reached a high level of mastery, and then stopped learning for undisclosed reasons. Wei's description of language competence fossilisation is quite similar to the concept of the **learning plateau effect**, a notion that was first briefly touched on by Selinker (1993) and was more explicitly developed by Richards (2008). Wei seems to agree with Selinker on the notion of universal fossilisation. This means that, if fossilised patterns are spread and used widely among members of a community, then group fossilisation emerges. This often leads to the creation of dialects (with Indian or Singaporean English being prime examples), which include norms that are not encountered in the target language's grammar. Additionally, Wei seems to agree with Richards on the basis that, if appropriate strategies and techniques are applied, the learning

plateau effect can be removed, and learning can resume once more.

Wei (2008) attempts to attribute a more psychological aspect to the notion of the learning plateau, which might not be fully related to how the learning plateau actually works. This has to do with the learners' belief that they are not making any significant amount of progress, especially when they are learning a newer, or more advanced structure, even though this might not be true. Yi (2011:137) also encompasses Wei's point of view; he specifically mentions that "on the learning curve, big improvements come very quickly; then the rate of improvement slows right down to almost nothing." By providing a more motivational tone, Yi suggests that target language learners have extremely high levels of curiosity and desire to learn a new language at the beginning of the learning process, and as such, they feel that are successful and are not likely to experience any issues with it. However, as they keep learning, the sense of success fades away, and their motivational level drop significantly. Yi also suggests that the learning plateau effect can be given a more psychological aspect. Speaking in behavioural and psychological terms, when learners feel that they are not able to remember newly acquired elements of the target language, and are not able to apply them properly, they tend to avoid responding to the teachers' questions the way they probably used to, especially at the beginning of the course. These elements might include new lexical items, patterns and rules; while the learners seem more confident using them in class the moment they learn them, due to the influence of short-term memory, they might need more persuasion and encouragement to use them at a later stage, since their encoding within the long-term memory might not be yet complete (Tulving, 1972; cited in Yi, 2009). Yi additionally suggests that learners with this particular difficulty are not able to apply newly acquired linguistic items in a meaningful way; they still have difficulty using what they just learned naturally, just like they do when they communicate using items, they feel more comfortable with, despite the amount of their exposure to the target language. Their disability in producing meaningful structures using newly acquired

elements also attributes to a form of plateau effect; one that is temporary though and might disappear in time.

Over the years, a significant amount of research has been targeting effective and personality factors that affect language learning. Gardner et al (1959), for instance, debate the importance of motivation and personal qualities in language learning, considering them pivotal contributors to successful target language learning. This means that, if target language learners feel comfortable during the learning process, are highly motivated and have high expectations regarding their learning progress, then they are better candidates to fully attain the target language, contrary to the learners who do not have high attitudes towards that same target language. In an effort to explain why young learners acquire elements of a target language faster and better than adult learners do, and to possibly explain why elements of the adult learners' interlanguage slow down or totally cease to develop, Yi (2009) adopts Guiora's theoretical framework of the **language ego** (1972) – in other words, the learning profile learners form about themselves during the learning process. According to Yi, before and during adolescence, the language ego is very flexible and does not impose strict limitations, allowing young learners to successfully pick up elements of the target language, such as internal sets of rules and its phonetic system. In contrast, after the end of puberty and the beginning of adulthood, the language ego becomes less flexible and more frigid. Consequently, adult learners struggle to quickly and properly acquire target language features, since the language ego functions more like a barrier, psychologically protecting the adult learners and inhibiting the swift access to the target language elements. Displays of anxiety in practising, frustration in cases of failure and embarrassment in front of their peers might ease up the emergence of a learning plateau that will obstruct their learning experience.

Summarising, the learning plateau effect differentiates from fossilisation in the sense that

it is temporary, not permanent. As a concept, the learning plateau effect originates from Selinker & Lakshmanan's notion of stabilisation (1992), which signifies the potential existence of fossilised patterns in the learners' interlanguage. As Han suggested though (1998), not all forms of stabilisation lead to fossilisation. Fossilisation is a more cognitive process, and many empirical and longitudinal studies at the level of interlanguage subsystems are requested to examine whether it can be overcome. On the one hand, Richards (2008) justifies its ability to remain permanent, in the sense that target language learners might get stuck in particular components of that language, unable to assimilate them and proceed, and despite any amount of motivation, or input – he still recognises, though, that the plateau effect is not permanent, unlike fossilisation. On the other hand, stabilisation cases that emerge within the interlanguage as a result of plateau effects can be attributed to external factors, not necessarily associated with learning, they do not signify an unavoidable end in learning and can be effectively treated by using specific means. Some of them have already been mentioned earlier, and more will follow later in this chapter.

2.3.8 Preventing fossilisation and overcoming the Learning Plateau Effect

All the research that has been done regarding fossilisation seems to agree on its permanent status within the learners' interlanguage. In simpler terms, once it emerges in a subsequent system of the interlanguage, it cannot be treated. As it was established before, external factors that are attributed to the psychological profile of the learner might be responsible for the emergence of the learning plateau effect. In the case of fossilisation, however, this statement is not applicable; as Ushioda suggests (1993), failure in the overall improvement of the learners' linguistic mastery is not an outcome of motivational factors, but rather the existence of inaccurate forms. There are lots of examples of learners who have extremely high levels of motivation at the start of their learning journey, but after reaching a particular level, they get unable to improve their levels of linguistic attainment. As Chuanren (1992) suggests, a lack of

understanding of the pedagogical operations, a lack of understanding of the linguistic forms' nature and a misconception of the role accuracy plays in linguistic mastery and attainment are some of the possible problems that contribute to the inability of further levels of mastery.

However, not all the studies tend to be descriptive; in fact, some researchers have attempted to provide solutions that can prevent the emergence of fossilisation or at least some ways to make fossilisation less effective. For instance, Acton (1984) maintains that the answer to the problem of the emergence of fossilisation lies within the abundance of input opportunities during the first months (or years) of learning. Acton's proposed recommendation of appropriate input contains the following principles:

- a) **Teacher Input.**
- b) **Recorded input.**
- c) **Student Input.**

According to the first principle, preventing the emergence of fossilisation falls upon the teachers themselves. When it comes down to beginner classes, where learners first get in touch with the target language, Acton suggests that they should be taught by teachers who have a perfect command of the target language and can speak in a near-native language. This, of course, poses some considerable difficulties. In the context of teaching English as a foreign language, even if all the native speakers left their countries to teach the language, the demand for teachers would still be enormous. In many countries, teachers who teach English as a foreign language used to be learners of the language themselves. Undoubtedly, some of them might have had enough opportunities for linguistic input and output, substantial working or studying experience in English-speaking environments, or extensive training that would enable them to perform this role extremely well. In addition, the fact that potential discrimination between native teachers

and non-native teachers is being addressed in many countries, considering that there is research (e.g. Moussou & Llurda, 2008) showing potential benefits of the latter. However, this is not the case everywhere. In Greece, for instance, the right to teach English as a foreign language was, until recently, also exercised by people who were holders of C2-level qualifications. These people lacked any official training and, in many cases, minimal input and output experience in a native-speaking context. Therefore, it is crucial that only people with the right skills and experience should teach beginner levels, in order to set them up in the correct learning mindset.

The second and third principles require work from the teachers and the students themselves. In terms of the recorded input, teachers need to provide their learners with video-recorded (or even audio-recorded) input examples, so that learners are exposed to instances where learners speak with the right accent. However, other than the videos shown in the class, learners themselves should seek additional input opportunities for more practice and exposure. The third principle requires the learners' attention in order to be deemed successful. While talking to their peers within the classroom context, learners should notice the patterns that their peers are using, and either acquire the correct ones or attempt to improve their own.

However, if fossilisation has already emerged, especially in cases of learners who are past their puberty and whose ability to acquire features of the target language in a native-like way, Acton (1984:76-78) proposes a method, which can help reduce the spectrum of its effect. The proposed method includes the following steps:

- a) Creating a safe environment for discussion, in which learners can feel comfortable, relaxed and willing to participate.
- b) Applying strategies and methods that enable learners to do a conscious monitoring of the fossilised patterns they have produced and help them to gradually remove them.
- c) Non-verbal connections of pronunciation.

- d) Encouraging the use of dictionaries will permit the learners to check the relationship between writing and pronouncing words, especially those that include sounds that might not appear in other languages.
- e) Oral reading of texts that have been previously prepared by learners in order to help their pronunciation.
- f) Seeking the assistance of a native-speaking person that can help the learners improve their pronunciation.
- g) Applying all the corrections learners make while learning, such as in activities and the aforementioned reading tasks, into conversational tasks.

These suggestions, despite the merit they might have, focus only on the oral aspect of the target language. Fossilisation, however, does not only incorporate pronunciation issues, or other aspects in speaking. It affects elements of the written language as well, and this is part of what the intended study is going to investigate. Other researchers, such as Selinker (1993), remind researchers that there might also be other forms of fossilisation that should be taken under consideration. After all, fossilisation is not secluded and isolated, but occurs in different areas and affects different elements. Examples of **localised fossilisation** (cases where linguistic features are easily picked, but some others remain stagnant from the very early stages of learning), of fossilised errors occurring due to the simplification of the target language systems and rules are evident in case studies (e.g., Selinker, 1993), and keep stirring discussions among researchers, such as Corder (1981), who maintains that it is impossible for learners to simplify a linguistic set of rules if they do not actually possess. Another case study by Ushioda (1993), which focused on the relevance of acculturation in language fossilisation, showed that fossilisation might be overcome, though this might affect a small minority of the body of learners. Consequently, and by summing up some of the statements that have been discussed before, fossilisation is still an area that functions unpredictably and requires a significant amount

of work in terms of analysis and overall understanding. With the correct methodology and tools, and a significant amount of time ahead of potential researchers, fossilisation might be eventually decoded and resolved. For now, it shall remain a linguistic conundrum (Han, 2003).

While fossilisation remains an issue that requires further investigation and research, the learning plateau effect provides a more promising environment for research and is more prone to viable solutions. After all, research has shown that the learning plateau effect is not permanent, but temporary (Richards, 2008). Earlier in this chapter, various suggestions regarding methods and techniques to overcome the plateau effect have been suggested. Wei (2008) recommends the active involvement of learners in the learning process, by being provided activities that improve their motivational levels, enhance their attitude towards learning the target language, and urge them to notice the differences between forms and meanings. Wei also suggests that learners should be involved in tasks that require them to interact with native speakers of the target language, in contexts which are as authentic as possible, and with clear objectives that will inspire the learners and will allow them to participate and speak as fluently as possible.

Richards (2008) also makes a few suggestions that affect the way teachers interact with their learners. For instance, teachers should be recording themselves and listen to the recordings of their own target language output, or even ask others to monitor their speech patterns, in order to improve those aspects that might be needing additional work and provide a model standard of speech to their learners. Richards also adds that teachers should be paying more attention to error correction, including error correction frequency and the accurate selection of mistakes to be addressed. However, in order for these recommendations to work, learners should be provided with “a rich source of language learning experiences that allow for the gradual development of language skills across the different modalities of speaking, listening, reading, and writing” (Richards, 2008:20). These language learning experiences will permit them to monitor their own

progress, have liberty in managing their own progression, be aware of possible difficulties and restrictions as a result of the existence of learning plateaus, but also be aware of the means that can assist them in overcoming these plateaus and move closer to perfect linguistic attainment. Richards' suggestions regarding attention to error correction and the frequency this occurs, as well as Wei's recommendation regarding the interaction of the learners in a native-like context of learning, with ample opportunities for practice that can lead to the production of fluent and accurate language, thus reducing the cases of inaccurate linguistic output, were the concepts that have inspired the research questions asked in this project. With the lack of a native language teacher, though, and considering that the learning does not take place in a location where the target language is the language commonly spoken, technology is one possible alternative that could be used to test and implement some of the suggestions described, in order to help learners overcome the issue of erroneous linguistic output, and to address the research questions asked in this study. Artificial intelligence, in particular, provides a direct means of interaction with the learners, while utilising accurate language. The next section will explain why technology is useful in the learning process, leading towards the benefits and the drawbacks of artificial intelligence tools as an instrument for learning.

2.4 Educational technology

Garrison & Anderson (2003), as well as Richey (2008), have tried to provide a definition of technology as clearly and efficiently as possible. Most specifically, they have tried to define the different forms of technology that are applied within the classroom specifically, and education in general, thus making them the focus of this research proposal. Therefore, it could be inferred that educational technology is none other than the effective use of technological tools and instruments in learning, which may include media files, computational and audio-visual equipment, as well as networking hardware. According to Selwyn (2011), educational technology has become synonymous with electronic educational technology (e-learning),

something which is a major characteristic in today's demanding society.

Tavangarian, Leypold, Nölting and Röser (2004) maintain that educational technology includes a range of media that can deliver images, audio, video and animation. It is based on the use of technology equipment such as audio or video tapes, satellite TVs, CD and DVD-ROM, computer-based learning, and on the use of local intranet/extranet and Internet-based learning as well.

In a later study, Zhao (2013) describes educational technology as the systematic design, implementation, and assessment of technology-based solutions in a variety of educational settings. This definition incorporates the multidisciplinary nature of educational technology, focusing on utilising technology in a way that can enhance learning outcomes. In addition, educational technology involves the study and ethical practice of improving the learning rates and performance through the creation, use, and management of appropriate technological processes and resources (Kline et al., 2020). This definition manages to highlight the active role technology plays in the overall learning process, as well as the opportunities learners have to practice what they have learnt.

The application of technology in education has evolved to acquire new roles; technology can now function as a tutor, a teaching aid, and a learning tool. This can be evidence of the different ways technology is used in educational contexts, as well as the different ways aspects of the learning process are supported by technology (Mahmud et al., 2021). Moreover, the analysis and study of the different ways technology is used in educational contexts is important, as this can reveal the educational potential of technology and help to understand how it can support learning effectively (Xue & Han, 2023).

Generally speaking, the use of technology in language learning and education has indeed become increasingly prevalent in recent years. Technology offers a wide range of tools and resources that can enhance language teaching and learning experiences. It has been noted that the proliferation of computers in the language learning classroom is important for language teachers embracing the use of computer technology to understand the norms of language use during computer-mediated interaction and their potential relationship to second language acquisition (Smith, 2003). Furthermore, the use of technology has made it possible to have more fascinating and productive teaching and learning sessions, particularly in language learning (Iberahim et al., 2023). This is supported by the fact that technology has been used to assist and enhance the learning process, particularly in language learning (Muhtar, 2021).

The integration of technology into language learning has also been found to reduce teacher-centeredness, thereby reducing student language learning anxiety and providing them with the chance to practice language comfortably without being embarrassed of making mistakes, ultimately reducing their "affective filter" (Softa, 2022). Additionally, the COVID-19 pandemic and the subsequent lockdown led to a rethinking of modes of delivery for various subjects, including foreign languages, in terms of the use of technologies which allow for the continuation of learning in isolation (Markovina & Krasilnikova, 2022). Moreover, the use of technology in language learning has been found to provide individual users with a high level of control and interaction, ultimately enhancing learners' all-around English language capacities and autonomous learning abilities (Ren & Ma, 2016). It has also been noted that technology attends various language learning contexts, both inside and outside the classroom, during projects, tasks, and relaxed learning time, thereby enhancing language learners' achievement and autonomy (Diari et al., 2023).

However, with the ongoing development of technology, some other forms of technology

can be considered for classroom application. A good example is the utilisation of artificial intelligence (AI). Poole, Mackworth & Goebel (1998) first talked about the so-called *intelligent agents*, a term that applies to any piece of software or application that is able to understand its environment and perform tasks or actions that are carefully calculated in a way that maximises the possibilities of the successful completion of its targets and goals. Today, modern devices are equipped with forms of A.I., and the different operating systems of computers and smartphones also come with their own A.I. assistant. Users worldwide often have to interact with these ‘assistants’ in one way or another, and therefore it would be of great interest to explore the language used during these specific interactions. Seeing whether users are able to use correct language while interacting with AI assistants and observing the ability of AI assistants to process and understand the language used by the owners of the supported devices can define possible issues in the verbal interaction between the user and the assistant and the areas in which future corrective instruction could focus on.

However, before looking at the use of AI in education and language learning in more detail though, it would be useful to look at the different ways technology is used to enhance learning, and how they have been developed through a number of different studies. The next section focuses on CALL and MALL technologies, showing how they can improve the overall learning experience. In addition, some of the tools that have been used in the present study have been selected having CALL and MALL studies in mind, though more details will be shared in the Methodology section.

2.4.1 Computer-assisted language learning and Mobile-assisted language learning

With the popularity of computer systems constantly rising, properly-equipped desktop computers (with laptops following later on) started getting installed in the classrooms, highlighting the beginning of a new trend in education and language learning - CALL, also

known as Computer-Assisted Language Learning. According to Levy (1997), CALL is related to researching and studying the computer applications used in language teaching and learning. Since then, different voices have expressed their own views regarding the definition and application of CALL. Schmid (2009) talked about contemporary CALL as it is used in interactive whiteboards, virtual learning environments, and distance-learning programmes, while Shield and Kukulska-Hulme (2008) expanded on virtual platforms, and mobile devices in the form of MALL, or mobile-assisted language learning. Thomas, Reinders and Warschauer (2013:4) suggest that CALL involves a wide range of interested parties, from designers and classroom practitioners to researchers and commercial material developers. Finally, according to Warschauer & Grimes (2007), CALL can also involve the learners themselves, especially those who are able to produce and consume materials by using tools such as blogs, wikis, podcasting, sharing and streaming technologies.

Research has proven that there are many benefits to using different forms of technology during instruction and the learning process. According to Grgurović, Chapelle & Shelley (2013), all the teaching sessions that are based upon the use of computers and different forms of technology are significantly better compared to more traditional forms, and the groups of learners that are being taught using technology seem to acquire knowledge and learn faster compared to groups who receive no form of CALL instruction. And the CALL-based instruction benefits just do not seem to end. Research has shown that the learners' attitudes and approaches towards the overall learning process seem to improve (Meunier, 1997), learning outcomes become clearer and are reached faster (Brandl, 2002), whereas the newly-acquired information that is communicated via CALL methods and structures is retained much longer (Ioannou-Georgiou & Michaelides, 2001).

Still, CALL does not come without any shortcomings. Gips, DiMattia, & Gips (2004)

suggest that the setting up of a proper CALL educational background means that educational costs are increased, thus putting poorer schools and students at a disadvantage. In addition, Roblyer (2003) mentions that both teachers and learners might be lacking basic technology knowledge, and are thus not able to reap the benefits of using computer technology. Dent (2006) also believes that computers are not able to come up with the learners' expectations, as the learning conditions keep changing, but technology does not. To be more specific, he suggests that computers are unable to solve the different problems learners face the way teachers do since computers and humans process incoming information in different ways.

Of course, technology has made a lot of advancements and has evolved in ways that people could never imagine. With the introduction of smart handheld devices in our lives, it would only be a matter of time before they could find their way to the classroom. According to Kukulska-Hulme & Shield (2008), these technologies have been gradually integrated into the learning process, and educators have been trying to implement materials that can support different teaching styles and learning methods. As a result, there is a switch from CALL to MALL (mobile-assisted language learning) which, according to Ogata et al. (2010), depends and operates on a range of handheld mobile devices, such as personal digital assistants (PDAs), cellular mobile phones and smartphones, pads, pods and others. Huang et al. (2012) suggest that mobile technologies have a number of advantages. More specifically, he mentions that they are friendly to use, small and easy to carry, flexible and not as expensive as computer systems. On the other hand, Albers & Kim (2001) believe that not everything is perfect with mobile technologies, as mobile devices often come with small screens, cannot display educational software with the same fidelity as computers can, and require access to the network in order to function properly.

Despite the shortcomings, MALL is gaining ground in education. Educational platforms

such as Moodle and Blackboard can be accessed from MALL-compatible devices, whereas educational tools such as Kahoot, require the use of such devices to function. More importantly, though, MALL is going to be an integral part of this research, as a variety of apps are going to be used in order to study the learning habits of participants and whether the hurdles imposed by fossilisation can be completely removed (or reduced); apps, which need to satisfy two criteria, according to Hemard (2003): being both useful and enjoyable, so that they can be assessed freely, without necessarily being part of a classroom. However, the application of technology in the learning context, either via computers or mobile devices, needs to be done with the idea of task-based learning in mind. As Thomas (2013:342-343) suggests, the use of technology should be done in a way that enforces communication and the learners' use of the target language, while being presented in the form of clear tasks for them.

2.4.2 Technology and Task-Based Learning

Considering that this research project utilises technology-related tools for the completion of tasks, it would be wise to explore the concept of task-based learning, and how this is related to technology. Task-based language teaching (TBLT) has been in the spotlight of academic interest and research for the past 30 years. It can be defined as “a process-oriented approach to language teaching that centralises communicative language teaching at the heart of syllabus design and instructional goals (Littlewood, 2004; Nunan, 2004; Richards, 2005, cited in Lai & Li, 2011:498). In essence, task-based language learning encompasses the opportunities given to learners to practice meaning-making while participating in communicative tasks in the context of the classroom. Also, task-based language learning studies and theoretical frameworks originate in second language acquisition theories, particularly those that focus on the interaction, the sociocultural, and the ecological approaches (Ortega, 2009a).

Researchers seem to disagree as to whether the classroom context can be deemed the

most suitable environment for the application of authentic, communicative tasks. Ellis (2003) acknowledges this difficulty, because learners understand that they should only be in the class to learn, while their teachers should only be in the class to teach. According to Ellis, task-based learning practically teachers and students to “forget where they are and why they are there” (p. 252), which is hard to realise, considering the “educationally imperative” nature of the classroom (Goffman, 1981, p. 53).

Carless (2004) and Littlewood (2007) presented some other challenges regarding the application of such tasks in a classroom environment. These include:

- a) heavily teacher-focused learning sessions, where learners are passive receivers and rely solely on their teachers.
- b) behavioural and discipline issues in full and crowded classrooms, especially in cases where learners tend to speak loudly and simultaneously.
- c) mixed skills and proficiency levels in the classroom.
- d) hesitation and/or neglect on the students’ part in using the target language to complete these tasks.

Many of these challenges are due to the temporal and physical constraints of the classroom context and could potentially be minimised with the assistance of technology. After all, research implies that the use of technology has enough merits. For instance, Skehan (2003), Stone & Wilson-Duffy (2009) suggests that with the use of online resources and materials, communication and information technologies expand the variety of tasks exponentially. González-Lloret (2003) and Sadler (2009) seem to agree that the use of technology maintains the authenticity of tasks and keeps motivation for task implementation at high levels. Kern, et. al, (2004), Kern (2006) and Reinders & White (2010) additionally suggest that technology helps learners to associate themselves with their tasks and adapt them to their own understanding and

range of skills, while Lai & Li (2011) believe that technology provides convenient opportunities for follow-up, post-task work that can help students further their understanding of language and culture in general.

The relationship between task-based language learning and the use of technology is also considered in relative research in digital literacy. Researchers such as Murray (2005) and Warschauer (2006) consider that the use of technology is crucial in terms of promoting the further development of digital literacies, considered an important aspect of language learning in our times. Hampel (2006) and Chun (2008) regard that learning languages via technology requires and triggers social, behavioural, cognitive and attitudinal mechanisms, a fact that does not necessarily occur when someone attempts to learn a language via more traditional means, such as face-to-face interaction.

As a field, task-based language learning also provides ideal linguistic contexts and opportunities for negotiated interaction, thus making it beneficial for language learning. In addition, the sociocultural aspect of language acquisition studies seems to further enhance the value of task-based language learning. The implementation of physical, social, and symbolic notions within the tasks provides opportunities for scaffolding and collaborative dialogues that are the essence of learning.

Samuda and Bygate (2008) proposed a definition that examines the most valued and subtle features of a successful task. For them, a task is “a holistic activity which engages language use in order to achieve some non-linguistic outcome while meeting a linguistic challenge, with the overall aim of promoting language learning, through process or product or both” (p. 69). A year later, Ellis (2009) attempted to provide another definition of what a ‘task’ is, by using the following criteria to effectively summarise it. These criteria suggest that:

- a) the primary focus should be on ‘meaning’, which indicates that learners should be concentrating on understanding the semantic and pragmatic meaning of linguistic items they come across
- b) there should be a form of ‘gap’ within the tasks that allows the learners to convey information, express a point of view or infer a particular meaning.
- c) learners need to rely on their own cognitive skills and abilities to complete an activity.
- d) acquired language features should be used as a means for completing the task, not just for the sake of merely using them.

According to Ortega (2009a), these two definitions consist of the most prominent approach to how tasks should be utilised in terms of providing well-controlled and structured activities that attempt to improve the language learning process. As a result of this, lots of researchers have studied the implementation of traditional tasks used in education, such as jigsaw tasks, or decision-making tasks. The implementation of technology in this context, however, drastically changes the way tasks are created and permits the creation of tasks that offer learners more liberty to solve them. Lamy (2007) believes that technology-enhanced tasks offer an exponentially wider space for learners to make inquiries, approach them through different angles and attempt to deal with them using their own skills and abilities. To borrow a term from the video games world, technology-enhanced tasks could be considered as ‘open-world’ tasks, in the sense that they reach the same goal, but offer a wider variety of approaches that lead to it. Of course, technology-enhanced task learning requires way more resources in designing and testing them, a fact that might not be viable and applicable in many language learning contexts. This is possibly another reason that indicates a turn in studies that stress the significance of technology-enhanced tasks, such as those that require the creation of projects in intra-cultural and intercultural environments, or projects that require access to, and tools from the Internet.

2.4.3 The merits of using technology in task-based learning.

There are many studies that have investigated whether language output increases during task performance in technology-enhanced tasks. Beauvois (1995), Chun (1994), Kelm,(1992) Kern (1995), Sullivan & Pratt (1996) and Warschauer (1996) have all associated potential benefits with tasks that require text-based computer mediation. These particular tasks are being done anonymously and in safe environments, which may help lower the learners' affective filters while working on the task, thus improving the output that is produced by the learners this way. Text-based computer-mediated tasks seem to target different elements of the language and affect learners in becoming more engaged. It has been observed that learners find these tasks very motivating; and since they are working in a safe and anonymous environment, they feel safer and more willing to produce longer sentences, use a bigger variety of words, and even take more turns in completing the tasks, just to spend some more time working together with other learners. Different types and versions of computer-mediated communicative tasks have also been found to work differently for each learner and affect different aspects of their linguistic output. Perez (2003) discovered that learners produced a greater amount of linguistic output while working with other learners on online tasks, whereas Abrams (2003) witnessed the same thing while learners were interacting with each other in synchronous computer-mediated communicative tasks. Yamada (2009) also suggests that similar reactions from learners are observed in cases where computer-mediated tasks include audio files, video files and texts that can be accessed by learners all the time, without limiting their access to a specific part of the task. Additionally, learners tended to spend more turns in doing the task when they were participating in face-to-face sessions while working online, formed longer sentences and uttered more words, even if the visual stimuli for that were absent.

Text-based computer-mediated communicative tasks utilise a type of written conversation that brings together the positive aspects of oral communication and written

discourse during task performance. Bölke (2003) and Kitade (2000) seem to agree that these types of activities showcase the effect they have upon the learners since learners become able to produce longer and more complex structures in task performance, rather than in regular classroom environments, in face-to-face interactions. Salaberry (2000) adds to this by suggesting that, among the benefits that have been mentioned before, it would be wise to count the production of more grammatically accurate, and error-free utterances. According to Chun (1994) and Wang (1994), learners have been able to perform in a similar manner while they participate in simple text chatting sessions. Interestingly, Svensson (2003) seems to report similar findings in cases where learners interact with 3D virtual environments, where interaction with other learners might be more limited, or possibly asynchronous. Additionally, Heins et. al (2007) discovered that learners are more engaged and prone to using the target language in online audio chat sessions and avoided talking about irrelevant things to each other while they were engaged in the task. Finally, Mark & Coniam (2008) proved that collaborative work in a wiki context seems to develop and improve the learners' creativity in writing since they were found to use more advanced linguistic features in their projects.

Sotillo (2000) made another interesting discovery regarding the quality of the written and spoken forms of communication during technology-enhanced tasks. Communication in synchronous interactions between learners felt more natural and freer, similar to how communication occurs in face-to-face conversations. On the contrary, communication in asynchronous interactions felt more restricted, similar to the type of interaction often encountered in classrooms and falls into the initiation-response-feedback pattern in teacher-student interactions. However, Sotillo (2000), and later Kitade (2006) and Hwang (2008) found out that there is also merit in asynchronous interactions, in the sense that learners use richer and more complex language, while they also form longer and more accurate sentences.

The nature of interactions that are offered in technology-enhanced activities, and the way

these are differentiated from more traditional tasks reflect on the learners' independent approach to language use. Yamada (2009) has discovered that accuracy does not only appear in sentence structure but in grammar use as well. After working with some learners on computer-mediated tasks using text chat features, Yamada realised that learners were exercising noticing and self-corrections at a higher level of frequency, compared to more traditional tasks. This observation also falls in place with what Sykes (2005) suggested before; written computer-mediated communicative tasks allow the learners more liberty and flexibility in using the target language in a pragmatic way, a fact that is not as easily applicable in traditional face-to-face sessions, or in oral computer-mediated tasks. Additional research has attempted to reach similar conclusions regarding the production of more complex language with the use of computer-mediated communicative tasks. Kitade (2000) and Smith (2004) attribute the increase in complex and accurate linguistic items that appear in the learners' output to the additional time and the liberty they have while performing these tasks. These two characteristics allow the learners to carefully check and monitor the language they use in these tasks, thus resulting in a more accurate and complex output.

At this point, it should be accepted that the notion of 'careful monitoring' of the output is similar to the notion of 'noticing', i.e., the ability of learners to become aware of the mistakes they have made and attempt to self-correct them. Empirical-based studies have shown that there is a connection between noticing and the use of technology in tasks. Lai & Zhao (2006) discovered that learners self-corrected more frequently while doing online, chatting-based tasks, rather than doing tasks that require a certain level of face-to-face communication. Smith (2008) established that learners have been self-correcting grammatical-based errors while performing online tasks, rather than errors based on lexical accuracy. A couple of years later, Sauro and Smith (2010) attempted to make connections with what had already been established from these empirical studies. Once more, they suggest that the enhanced self-monitoring, which is

developed during online text-based task performance, might be responsible for the heightened levels of accuracy in the learners' output.

In that same year, Kenning (2010) discussed the possibility that all these observations regarding the improvement of the learners' output in computer-mediated tasks might be affected by certain features of technology-based communication, such as typing, or speaking to other learners in front of a computer screen. It is a notion that has also previously appeared in literature. More specifically, Darhower (2002) suggested that, through the use of online, text-based chatting activities, learners manage to create their own learning norms, and they also acquire a level of learning independence and autonomy that is not normally found in the typical, less flexible classroom environment. This is a fact that is reflected in the types of tasks used in the classroom, and the learning outcomes. For instance, discussions in the typical classroom context might often be based upon tasks that target negotiated interaction. According to Blake (2000) and Jepson (2005), free online discussions do not encourage negotiated interaction tasks among learners. Despite this, Toyoda & Harrison (2002) and Smith (2003) suggest that, even in a technologically enhanced environment, this type of interaction might surface within carefully designed tasks, especially those that encourage the use of fora, or communication spaces where learners can contribute to each other's points of view. Finally, Pellettieri (2000), Lai & Zhao (2006), and Lai, Fei, & Roots (2008) have stressed the fact that learners are able to develop higher levels of noticing after receiving feedback from other speakers (or participants) during computer-mediated tasks, a fact that is of vital importance when it comes down to their overall linguistic development.

2.4.4 Understanding task-based language learning using technology

There is no doubt about the fact that technology-based tasks play an important role in the language learning process. Hampel & Hauck (2004) and Hampel (2006) explicitly mention that

both teachers and learners have provided positive feedback in cases where learners had to use technology-enhanced online tutorials in task-based learning. Appel & Gilabert (2006) reported that learners who were engaged in technology-based tasks produced more output compared to traditional tasks. The frequency of linguistic production and the use of language as a means of communication with their peers also increased exponentially. Rosell-Aguilar (2005) and Duran & Ramaut (2006) have confirmed that it is also possible to design computer-mediated tasks and have them applied even in beginners' courses with success. Smith (2009) has even made suggestions about creating computer-mediated tasks that can be used outside of the traditional learning context, as extracurricular activities, that can provide additional opportunities for practice.

The more technology-based tasks (and technologically enhanced task-based learning in general) are implemented into the learning process, the more effort to evaluate them and understand their worth is made by researchers. In this sense, it is important to outline the characteristics a technology-based task needs to have for optimum outcomes in the learning process. Warschauer (2001) suggested that a project-based learning model could possibly maximise the benefits of tasks that are technology-enhanced and oriented.

Chapelle (2001) suggests that appropriate tasks need to be authentic, focus on meaning and form, and require the learners to use a variety of resources within a specific technological context during the practice sessions. This way learners can be exposed to intriguing themes and topics that cannot be applied within the classroom, ensuring their active engagement with them. Hampel (2006), expands Chapelle's work by adding two additional criteria that should be considered during task designing. For Hampel, tasks need to:

- a) encourage the overall understanding and know-how of using tools and applying technology to learn

- b) be organised in a way that allows learners to fully acquire the potential benefits of tasks with communicative features, a notion that is also discussed in Hauck and Young's (2008) study.

Teachers and instructors have a pivotal role to play in Hampel's model. They need to provide clear instruction to the learners regarding the tasks, and they should provide guidelines regarding the use of more sophisticated communication skills, so that learners can self-reflect on their use of specific communication features, such as the use of lexis, syntax, organisation and content. Additionally, teachers need to prepare their learners to critically assess the information they receive while participating in communicative tasks that have been built upon certain communication contexts, in order for them to adapt to the requirements of international communication and cooperation.

Redefining the features of effective tasks is only part of the researchers' investigations - another focal point in research deals with the reassessment of the nature of task performance. While learners are engaged in technology-based tasks, they do not only focus on linguistic competence; characteristics such as intercultural understanding, or digital literacy are additional aspects that are essential in the effectiveness of certain tasks and can be listed among the useful skills that need to be picked from the learners. Lamy (2004) moves this notion a bit ahead, by suggesting that technology-oriented task-based learning should not only include linguistic and functional competence skills – environmental competence (i.e. the demonstration of using tools offered by the environment, and the understanding of how to use them) is also another aspect that should not be disregarded. It should also be noted that a couple of years earlier, Kramsch & Thorne (2002) attempted to make a distinction between sociocultural and institutional competence, two additional features that should be considered while investigating the nature of task performance. Sociocultural competence is about understanding the social and cultural

norms upon which the technological tools used in tasks are developed, whereas institutional competence involves is about the ability of participating and maintaining a form of dual discourse while using various technological tools. Warner (2004) seems to accept the suggested features that have been presented so far, while also introducing the importance of ‘play’ in task performance – in other words, the use of activities such as role-playing in computer-based tasks that display the development of the learners’ linguistic development.

Evidently, computer-mediated communicative tasks seem to include a major disadvantage, according to research. Existing literature (Blake, 2000; Ortega, 2009a) has shown that learners who are engaged in computer-mediated tasks seem to focus only on the meaning, while completely ignoring the form. Tudini (2003) also observed that learners receive minimum corrective feedback from teachers and peers that could help them to fix form-related issues. She recommends that a new learning model should be introduced in technology-mediated contexts, one that includes expanded pre-, and post-task stages, similar to what happens in a regular classroom context. There is substantial research on the importance of implementing this model in computer-mediated task contexts (Abrams, 2006; Thorne, 2006; Ware, 2005; Ware & O’Dowd, 2008). The pre-task stage could help introduce the learners to the topic of the task and provide them with the necessary lexical (and discourse) background knowledge and materials to cope with the requirements of the task. This stage is the perfect place for teachers to clearly communicate to their learners the evaluation criteria that are being applied during task performance. It could also help them assimilate the differences in communicative operations among different cultures, along with any perceptions and practices for a particular tool as they are defined in a cross-cultural context. The post-task stage in computer-mediated task studies is also of equal significance, according to existing literature. Furthermore, the literature also acknowledges the significance of the post-task stage (Skehan, 2003). According to Ware & O’Dowd (2008), teachers need to design a variety of tasks, using different tools, which are based

on elements learners have encountered at previous stages of the learning process. An example of what a post-stage task could be, according to Levy & Kennedy (2004), is the analysis of the recordings of the audio interactions between the learners from the learners themselves, and the sharing of visual materials on the computer screen that is related to the task the learners were previously engaged and can help the learners to evaluate themselves on their use of form.

2.4.5 Challenges of using technology-enhanced tasks for research and methodology purposes

The connection that exists between task-based learning and technology offers a significant number of benefits, both in terms of research and applying its findings in the learning process. However, despite its promising nature, technology-enhanced language learning has brought forward a series of issues that need debating and consideration. Existing literature has shown that the notion of applying technology-enhanced tasks in accordance with task-based learning principles may prove to be a challenging issue for researchers, teachers, and learners alike.

The big issue with the researchers lies in the difference that occurs with task-based learning occurring in physical classrooms and technology-based contexts. As such, it is difficult for researchers to capture the real essence of task-based learning by only focusing on the existing empirical studies. According to Chapelle (2001) and Warschauer (2001), technology-enhanced, task-based learning no longer focuses solely on the learners' linguistic development, but also on additional skills that include their ability to adapt in intercultural learning environments, to operate technological media and communicate efficiently with their peers in an online context. The fact that the performance of learners while applying these skills cannot be easily measured or defined is an issue that poses difficulties to potential research studies.

Researchers have also come across the issue of evaluating online-based interactions and communication using the existing, conventional models of evaluation. Smith (2003) believes that, since online and other technology-based communication environments lack the ability to apply turn-based conversational models as they do in face-to-face communication, the necessity to adapt all existing negotiated-task models increases significantly. For this aspect, any split-negotiation routines that occur in computer-mediated communicative tasks (i.e. the delay between the communication prompt and the sign that indicates the start of the conversation) need to be taken into consideration. In a study that was published two years later, O'Rourke (2005) seems to agree with Smith. More specifically, he believes that when it comes to online communication environments and modes of operation, any existing signal-response classifications need to be modified to better suit the need to study the density of conversation-related data occurring in this environment. In a similar manner, Warner (2004) suggests that the existing definitions of communication cannot be successfully applied to the entire range of communication within a technological environment. As a result of the above, Chun (2008) that a new model of analysis should be developed; one that removes the outdated features of the traditional face-to-face communication model and adapt it to accommodate the various characteristics and features of recent, technology-mediated contexts.

Researchers are facing difficulties while attempting to decide on the course of the appropriate methodologies for technology-enhanced, task-based learning research. Smith (2008) completely disregards the use of printed transcripts as a source of data, suggesting that important data features, such as the deletion of words while typing, or even the words that were originally used before a possible change, are of great value in relative studies, but cannot be depicted in the final version of the text. Additionally, he believes that printed transcripts are deemed way too simplistic as a data collection feature, and studies using them cannot guarantee viable research

outcomes. Seedhouse and Almutairi (2009) seem to embrace Smith's point. They point out that task-based interaction is multi-faceted, a characteristic that is extremely difficult to display in a chat transcript which, in turn, is a medium that cannot accurately present the distinct details of linguistic process and production. As a result of this, they suggest utilizing available technology in a way that could possibly provide the necessary solutions to this problem. This includes using software that captures the activity of the learners while working in a desktop environment (screen recording), or video recording hardware that allows researchers to study the expressions and the gestures learners make while working in front of the screen. The capturing process of these small, yet invaluable sources of data, can provide researchers with a more accurate, clear and dynamic insight into the learners' interactions with each other and with the technology tool they are using, in order to analyse and describe key aspects in the learning process, such as task performance, noticing of their output and possible focus on form.

2.4.6 Challenges of using technology-enhanced tasks for teachers and learners

The difficulty of properly evaluating and applying technology-enhanced tasks in task-based language learning does not only affect researchers. As Wang (2006) suggests, this might be a significant issue for both teachers and learners.

For starters, many researchers (Fuchs, 2009; Lam, 2000; O'Dowd & Eberbach, 2004; O'Dowd & Ritter, 2006; Ware & Kramersch, 2005) have taken into consideration a critical issue that occurs within many educational contexts; that of the teachers' personal attitudes towards using technology. It has been suggested that teachers do not feel that there is merit in using technology for various purposes within the learning context. Due to this, they avoid using it in the learning context and do not prepare their learners well enough to participate in intercultural learning environments in a successful way, or to cleverly avoid making mistakes in communication due to inadequate understanding of potential cultural norms. Additionally,

Carless (2009) and Jeon & Hahn (2007) mention another important issue for teachers; the technological illiteracy that many teachers are facing. These studies point out that many teachers are not well prepared to use technology in task-based learning, due to a general lack of training and understanding of the qualities of technology-enhanced, task-based learning. Existing literature (Chun & Wade, 2004; Hampel, 2006; Hampel & Hauck, 2005; O'Rourke & Schwienhorst, 2003; Kern, 2006 and Son, 2007) suggests that teachers have a big variety of roles to play, in order to ensure optimum results in the language learning process and complete efficiency with the engagement of their learners during task performance. Among these roles, it is important to emphasise the following ones:

- a) Raise learner awareness regarding elements of the language that are included in the task(s)
- b) Be familiar with the culture of the first language learners and target-language-related content that might conflict with certain cultural traits
- c) Design appropriate and engaging tasks
- d) Notice and monitor any signs of cooperation among the learners
- e) Provide ample support, so that the learners can be more willingly and easily participate in successful interactions with each other
- f) Provide feedback regarding the interactions of learners with each other, and with other learners that are participating online

Teachers are also required to participate in certain tasks that take place in the pre-task and post-task stages. O'Dowd & Eberbach (2004) suggest that teachers should provide substantial training and awareness-raising activities. For instance, apart from preparing their learners to notice specific linguistic elements that appear within the task, they should also enable their learners to become more sensitive to intercultural differences, while working in an intercultural training and task context. Ware & O'Dowd (2008) focus mostly on speaking tasks and

recommend that teachers should clarify to their learners the fact that they are going to receive corrective feedback that targets specific features of their performance. Levy & Kennedy (2004) support the use of transcripts in the context of encouraging their learners to reflect on their oral output, as well as on potential problems that have emerged due to intercultural misunderstandings.

Technology-related illiteracy, which was mentioned to be a critical issue for some teachers, can also be attributed to learners. Lai & Li (2011) maintain that, while designing technology-enhanced tasks in a task-based learning context, factors such as the learners' digital literacy, communicative -and even intercultural- competence should be taken under serious consideration; otherwise, a potential lack of these skills, adding to the teachers' negative attitudes, cannot guarantee positive outcomes. Reinders & White (2010) mention that learners might be lacking the necessary technology literacy and awareness skills that can successfully engage them with technology-enhanced tasks or might not have a standard knowledge of the media, their capabilities and limitations so that they can meet their learning needs to the fullest (Hampel, 2006; Kress, 2003). Additionally, Lai, Zhao & Wang (2011) believe that technology-enhanced tasks might trigger unwanted behaviours from learners. More specifically, they have developed signs of frustration due to prolonged exposure to (and use of) the target language, inability to successfully build rapport with their peers and a general lack of group collaboration functions, as well as a sense of hesitation and demotivation, due to their own fear of making mistakes. While this might be a cultural trait, since the participants for that study belonged to the same ethnic group, this cannot exclude similar findings in learners from different cultures.

Interestingly, Kramsch and Thorne (2002) report another interesting issue, one that is connected to how learners from different cultures appreciate sociocultural norms in collaboration projects. Learners from two different countries participated in this study. They had to use a

variety of computer-mediated communication task tools that are used differently in each country. As a result, this caused a clash in communication expectations, an overall misunderstanding, and a sense of overall disappointment with the outcomes of their collaboration. O'Dowd (2003) and Ware (2005) have reached similar conclusions in their own studies, with participants belonging to different groups, suggesting that among the general sense of intercultural awareness and understanding, learners need to develop an extra level of consciousness that will allow them to better understand their own behaviour in task performance, and how they can better adapt to the level of their task collaborators to ensure better results.

2.4.7 The role of technology in providing corrective feedback.

Having considered the challenges of designing and using technology-enhanced tasks in a learning context, and before moving to the final part of this chapter, it would be wise to investigate the importance of corrective feedback and what is the role of technology in it. The role of corrective feedback in language learning has been widely recognised in the literature. Research has shown that corrective feedback can benefit learners who have a positive attitude toward error correction and high language ability (Sheen, 2007; Metcalfe, 2017) emphasised the crucial role of corrective feedback, including the analysis of the reasoning leading up to the mistake, in the learning process (Metcalfe, 2017). Furthermore, studies have demonstrated that when learners receive explicit feedback on their attempts to communicate, language acquisition takes place, supporting the claims about focus-on-form (Ellis et al., 2006). Additionally, Rohmah & Halim (2023) highlighted the significant role of corrective feedback in improving the competence of speaking English (Rohmah & Halim, 2023). Moreover, the effectiveness of corrective feedback is influenced by students' beliefs in the feedback provided. Rich et al. (2017) suggested that for corrective feedback to be effective, it needs to be believed, especially when correcting common misconceptions (Rich et al., 2017). Additionally, the type of corrective feedback, whether direct or indirect, has been found to impact language accuracy, with written

corrective feedback being important for improving language accuracy (Seiffedin & El-Sakka, 2017).

In the context of language education, teachers' corrective feedback has been shown to promote young learners' interlanguage development (Muslem et al., 2021). Furthermore, the importance of corrective feedback in developing students' writing skills has been acknowledged, with studies emphasising the significance of providing individualised attention through various forms of feedback (Sari, 2019). The impact of different types of corrective feedback, such as coded and uncoded written corrective feedback, on writing accuracy has also been explored, highlighting the importance of teacher feedback in writing courses (Ahmadi-Azad, 2014).

It would be safe to say that the literature recognises the importance of corrective feedback in language learning, particularly in promoting language accuracy, improving writing competency, and fostering interlanguage development. A good example is Lyster and Saito's investigation (2010) that emphasises the enduring and meaningful effects of corrective feedback on target language development, particularly through prompts, showcasing larger effects for extended treatments compared to shorter ones. Notably, beginning learners tend to benefit more from corrective feedback than their more proficient counterparts. This outcome might be connected with the overall linguistic proficiency of the latter group of learners, with the small number of mistakes that might keep appearing also confirming the existence of fossilised patterns in their output. Li's analysis (2010) delves into the explicit versus implicit nature of corrective feedback, revealing that explicit feedback tends to be more effective on immediate and short-delayed post-tests. Intriguingly, implicit feedback proves more enduring on long-delayed post-tests.

Additionally, the effectiveness of corrective feedback is influenced by students' attitudes, beliefs, and the type of feedback provided, emphasising the need for tailored feedback approaches to support language learning. Considering, however, that the development and the results of this research project depend on the concept of corrective feedback through the means of technology,

it is necessary to examine what the literature suggests about it.

Generally speaking, the use of technology and AI in providing corrective feedback has gained significant attention in educational settings. Learning analytics have been identified as a valuable tool for scaling the provision of personalised feedback, enabling instructors to leverage technology to deliver highly situated and personalised student feedback Pardo et al. (2017). Additionally, computer-mediated corrective feedback has been shown to benefit L2 writing skills, with modern technology providing immediate synchronous and asynchronous corrective feedback to language learners, thereby enhancing writing accuracy and development (Mohsen, 2022). Furthermore, AI has been integrated into the foreign language classroom through automated writing assistance tools, offering various forms of automated writing corrective feedback, thereby enhancing language learning and writing skills (Alharbi, 2023). Moreover, the use of direct corrective feedback through technology, such as Google Classroom and Google Documents, has been explored to assist students in improving their writing, demonstrating the potential of technology in facilitating comprehensive feedback delivery (Budiawan et al., 2022). These references collectively highlight the growing role of technology and AI in providing corrective feedback, emphasising the potential for personalised, immediate, and comprehensive feedback delivery in educational contexts. And considering that that this research project does depend on the ability of the participants to recognise and comprehend written corrective feedback through recasts, it would be interesting to look at a series of studies investigating meta-analyses on the effectiveness of this type of feedback. A good start would be Mohsen's study (2022), which indicates a substantial overall effect of computer-mediated corrective feedback (CMCF), with a particularly large impact on writing skills. The effectiveness of CMCF is further highlighted, revealing large effects on both writing fluency and accuracy, especially among beginners and intermediate learners.

Brown's study (2016) unveils potential variations in corrective feedback types based on the overall student proficiency, with teachers leaning towards more recasts for advanced proficiency students. Furthermore, Brown et. al. (2023) demonstrates that beginners may not significantly benefit from written corrective feedback, while both advanced and intermediate learners exhibit considerable gains, with advanced learners benefiting more – a trait that is quite significant for the present research study. Biber et al.'s comprehensive meta-analysis (2011) highlights the overall positive impact of feedback on writing development. Noteworthy trends include written feedback's superiority over oral feedback and the effectiveness of peer feedback, especially for L2-English students. The study suggests that a balanced focus on form and content is more effective than an exclusive emphasis on form.

In summary, these meta-analyses collectively affirm the effectiveness of technology, particularly CMCF, in providing corrective feedback for language learners, with nuances related to proficiency levels, age, and the nature of feedback. The studies highlight the potential of technology to enhance language acquisition and will be further explored within this study.

2.5 Artificial intelligence – An introduction.

Previously, the notion of applying technology in the educational context, among its merits, was discussed. However, with more advancements in technology, come more opportunities to apply them in the learning context. Artificial intelligence is a prime example of what evolution in technology can manage. If members of the public would be asked to describe the concept of artificial intelligence, there would be certainly many different viewpoints. However, most people would probably agree that artificial intelligence (or AI for short) is connected to computer and communications technology, quite possibly due to the way that AI is being used these days.

There have been many attempts to define artificial intelligence in literature. An early definition by Russel & Norvig (2009) describes artificial intelligence as a type of computational, or machine intelligence, which involves a variety of domains and fields where learning takes place, and “specific tasks, such as playing chess, proving mathematical theorems, writing poetry, and diagnosing diseases, can be performed” (p. 2). A rough, but rather acceptable, definition of artificial intelligence could be the ability of a device that is controlled by a computer to perform any number of tasks in a way only a human could (Nabiyev, 2010). These tasks could be undertaken through a variety of human-like qualities, including the ability to make meanings, generalise, learn from previous experiences, express reason, and other similar mental processes. A few years later, Nilsson attempted to define artificial intelligence as a complex, algorithmic system that can copy human intelligence (2014). For Nilsson, the way artificial intelligence operates and develops closely resembles the construction of the information processing theory of intelligence. In more simple terms, artificial intelligence functions as a data mediator. It receives raw data, processes the data in order to make it more meaningful for its operating systems and mechanisms, and then forwards the processed data back to the user(s) with hopes of achieving or satisfying the users’ requests.

Its development over the years has reached computers to the point where they can simulate intelligent human behaviours; operations such as analysis, inferencing or decision-making (Duan, Edwards, & Dwivedi, 2019; Topol, 2019) are examples that best highlight these advancements in AI and their application in various aspects of modern life. AI can be used in a variety of contexts. It can be used to provide quick instructions, or assistance, as part of a company’s customer support service. It can be used to provide recommendations or to perform specific tasks on our phones. Technology conglomerates employ AI assistants for a variety of reasons and purposes. Google Assistant, Bixby, Alexa are but a few examples of how AI can be entangled with everyday life in a way that feels natural, and not challenging. Some other

examples have even demonstrated that AI-based applications, in some cases, can even function as better as humans. For example, in 2016, Google DeepMind's AlphaGo defeated one of the world's most accomplished "Go" players, Lee Se-Dol, a South Korean champion (Sang-Hun, 2016). As the greatest proof of AI's human-like thinking and skills, the result of this match shows that a true artificially intelligent system is one that can learn on its own (Adams, 2017). In order to acquire a better understanding of the significance of this type of technology, it is clear that many AI-based applications have been ingrained in our daily lives. As Housman (2018) points out, artificial intelligence may perform admirably in:

- a) completing automated, repetitive activities by predicting outcomes based on data labelled by humans, and
- b) substantially improving human decision-making processes by feeding problems to human-created algorithms.

AI learns commands by repetition and generates decision paths for individuals by presenting options (McArthur et al., 2005). Intelligent tutoring systems (ITS) have been the earliest applications of AI in education. These systems have employed traditional learning and teaching approaches, such as drilling and practice. Drilling and practice involve students solving short challenges provided by the teacher to assess their comprehension during the learning process. Drill-and-practice ITS have primarily focused on well-defined and widely accepted learning objectives, often measurable through standardised tests, particularly in subjects like mathematics, which are typically part of traditional school curricula.

Developers of ITS have sought to demonstrate that these systems can significantly enhance the speed and quality of students' learning by combining traditional teaching and learning methods with conventional outcome evaluation methods, yielding some measure of success. However, McArthur et al. (2005) highlight a paradox that undercuts the significance of

these accomplishments. The advent of new technologies has necessitated the re-evaluation of traditional teaching and learning approaches, as well as the creation of novel methodologies and strategies that can be automated. One illustrative example is the automated spelling correction feature, which diminishes the importance of explicitly learning spelling while emphasising the need for "higher-order" skills essential for creative writing. Consequently, attempting to utilise new technologies in education to expand upon traditional learning goals or teaching methods becomes illogical.

The proliferation of artificial intelligence (AI) studies has exhibited a steady growth, attributable to the diverse range of operations that AI can execute. Significant advancements and discoveries in AI research have greatly impacted various technological domains, including visual and voice recognition, decision-making, natural language processing, and multilingual translation. Practical implementations of these advancements have taken the form of computer programs, applications, embedded control systems in equipment, and even robots. Current research has presented concrete illustrations of AI integration in real-life contexts. For instance, medical systems have been developed to assist human experts in disease detection and decision-making through the analysis of extensive data sets (Lathuiliere, Masse, Mesejo, & Horaud, 2019; Okuno, Nakadai, & Kitano, 2002). Additionally, robots are now capable of interacting with humans using visual and audio tracking technologies (Lathuiliere, Masse, Mesejo, & Horaud, 2019) (Li, Li, & Niu, 2020; Zhu, 2020).

The field of education has embraced the implementation of AI technologies, recognising it as a fertile ground for innovation. Artificial intelligence in education (AIED) has been a well-established research domain for over three decades since its first conceptualization (O'Shea & Self, 1986). The expansion of AIED, along with the multitude of studies and outcomes it has generated, has captured the attention of researchers in computer science and education.

Anticipated future investigations will apply AI to educational settings and explore potential strategies for advancing and teaching AI knowledge across various educational levels.

Regarding these AI-influenced studies, Hwang et al. (2020) offer several suggestions. For example, they inquire whether the utilisation of robots in classrooms can enhance students' learning motivation and engagement. They also explore the potential of an English article evaluation program to facilitate superior English writing outcomes for English as Foreign Language (EFL) students as compared to traditional instructional methods. Furthermore, they examine how AI technologies can aid policymakers in addressing ongoing challenges in education and making effective decisions in response to these issues.

One of the crucial objectives of AI in education is the provision of personalised learning guidance or supports to individual students based on their learning status, preferences, or personal characteristics (Hwang, 2014). From the perspective of precision education, which emphasises the need to provide prevention and intervention practices to individual learners by analysing their learning status or behaviours, enabling learning systems to serve as an intelligent tutor by incorporating experienced teachers' knowledge and intelligence into the decision-making process of the system is a crucial issue (Hart, 2016). In the early 1980s, the question regarding intelligent tutoring systems (ITSs) was raised by educational technology and computer science researchers (Larkin & Chabay, 1992; Van Seters, et. al, 2012).

Recently, a relevant term, called "adaptive learning system", has gained much attention because it emphasised the aim of facilitating individual students' learning by adapting several possible aspects of learning systems, such as user interfaces, learning content, or learning paths based on each learner's status (Essa, 2016; Xie et al., 2017, 2019). Using AI in education (AIED) has created new opportunities for designing productive learning activities and developing better technology-enhanced learning applications or environments. However, it

remains a challenge for most researchers and practitioners from the fields of both computers and education to implement relevant activities or systems (Kay, 2012). The challenges of developing intelligent tutoring systems and adaptive learning systems are not only computer programming skills, but also techniques of simulating the intelligence of human experts. The latter include the knowledge and experience of human tutors for making judgments and decisions based on the best available evidence to help solve individual learners' problems and help them learn better.

The roles and framework of AIED are closely tied to the challenges mentioned earlier. Understanding the roles of AI in education and the functioning of AI technologies is crucial for effectively implementing AIED applications and activities. By comprehending these aspects, researchers can address valuable AIED research issues and create intelligent tutoring systems that cater to students' needs. In this study, effort was made to delve into the specific roles that AI plays in AIED, such as acting as a tutor that observes the participants' output and provides feedback in the form of recasts. This type of AI application facilitates student learning, practice, and even interaction with peers or teachers, supplementing their education with hints, guidance, and support.

By connecting these ideas, the roles of AIED become even more prevalent, stressing the need for an interdisciplinary approach by involving computer scientists, learning scientists, teachers, and educational researchers in developing and researching AI applications for educational purposes.

2.5.1. Roles of AIED

From the perspective of educational applications, there are several roles of AI in education, that is, serving as an intelligent tutor, tutee, learning tool/partner, or policy-making advisor. These roles have been conceived and discussed through a number of studies in the

recent years and will be properly presented in this section.

The first role of interest is that of the Intelligent Tutor. This could be the largest category of AIED applications. Those intelligent tutoring systems, adaptive/personalised learning systems, or recommendation systems belong to this category. Several meta-analytic studies have demonstrated the effectiveness of intelligent tutoring systems to promote learning outcomes (Ma et. al, 2014; Steenbergen-Hu & Cooper, 2014; VanLehn, 2011). Examples of seminal intelligent tutoring systems include Cognitive Tutors (Anderson, Corbett, Koedinger, & Pelletier, 1995) that are developed to support tutoring in mathematics and sciences and AutoTutor (Graesser et al., 2004) is a dialogue-based tutor that support learning of physics, computer literacy, and critical thinking. A more recent example is ASSISTments that combines the features of intelligent tutoring with assessment to provide real-time feedback to students while working on assignments and offers data-driven reports for teachers on each assignment (Heffernan & Heffernan, 2014).

Next, is the role of the intelligent tutee. Studies in this category are rarely seen since most AI-based educational systems generally focus on helping learners rather than providing opportunities to encourage learners to serve as a tutor or advisor. Nevertheless, engaging learners in the contexts of helping others (i.e., AI tutees) understand complex concepts could be an excellent approach to promoting their higher-order thinking competences and knowledge levels. Although no studies have aimed to develop intelligent tutees intentionally and explicitly, many AI models and techniques are capable of acquiring knowledge and experience through the interaction with humans. The learning ability of AI models and methods can facilitate the development of intelligent tutees in the future. For example, a smart tutee could be a chatbot such as Microsoft Tay (Wolf, et. al, 2017) with a natural language processing interface and artificial neural networks. Members of the public made inappropriate comments about topics

such as racism and sexism while chatting with Tay. Tay imitated these comments and generated inappropriate expressions accordingly, and thus, Microsoft decided to shut it down. Ideally, if the ethics module can be embedded in the architecture of robots or chatbots (Arkin, 2008) and intelligent tutees can be developed, learners can interact with a well-developed chatbot or robot and "teach" it by providing training examples related to a particular topic. The chatbot or robot can then respond to the questions regarding the topic after the training process.

The third role to explore would be the intelligent learning tool or partner. From the perspective of constructivism and student-centered learning, the provision of an intelligent learning tool or partner is an important issue. The device can help learners collect and analyse data in efficient and effective ways, enabling them to focus on critical points or higher-order thinking (e.g., inference and prediction), rather than low-level tasks (e.g., editing and calculation). Some tools can even analyse and present data in a "smart" way to help learners think in-depth and to find valuable implications underlying the data. For example, traditional Mindtools, such as concept mapping tools, help learners to organise knowledge by connecting the relationships between concepts in a passive manner. In contrast, an intelligent concept mapping tool could advise or provide hints to the learners as well as evaluating the developed concept maps during the concept mapping process (Hwang, Wu, & Ke, 2011). More recently, knowledge graphs, as a popular field in the recent AI, can construct the relationships among the different entities from the massive volume of linked data based on AI models (Wang, Mao, Wang, & Guo, 2017). There have been some knowledge graph projects for educational purposes (Chen, Lu, Zheng, Chen, & Yang, 2018; Chi, Qin, Song, & Xu, 2018), which could be a promising research sub-area for establishing intelligent learning tools or partners.

The final role AI applications are asked to play is that of the policy-making advisor. AI techniques have been employed in informing and guiding development of policy or laws in the

recent years (Gasser & Almeida, 2017). Therefore, it is possible and feasible to develop a policy-making advisor for policy building in education. By effectively utilising AI technologies, policymakers can gain a more precise understanding of trends and challenges within educational settings, both at macro and micro levels. This enhanced understanding empowers policymakers to construct and evaluate effective educational policies (Gasser & Almeida, 2017).

Drawing upon research conducted by Macfadyen et. al (2014); Siemens et. al (2013); and Tsai et. al (2019), it becomes evident that AI-enabled policy-making advisors hold significant promise in the educational landscape. These advisors facilitate policymakers' ability to discern nuanced patterns and identify key issues by leveraging AI technologies' capabilities for analysing and interpreting large-scale educational data. This comprehensive perspective allows policymakers to make more informed decisions regarding policy development.

2.5.2 Benefits and drawbacks of using AI in education.

Artificial Intelligence (AI) has become a transformative force in education, offering numerous advantages that significantly impact both learners and educators. The integration of AI in education has particularly focused on enhancing the learning experience, resulting in personalised and tailored approaches to education (Chen et al., 2020). This section explores the advantages of AI in education, encompassing improved learner experiences, support for educators, enhanced access to educational resources, and advancements in the assessment process.

One of the primary benefits of AI in education lies in its ability to elevate learner experiences. By deploying AI technologies, educational interventions can be personalised to meet the unique needs and characteristics of each student (Li et al., 2020). This tailored approach not only fosters better learning outcomes but also enhances engagement among students.

Teachers and educators also stand to gain from the incorporation of AI in education. AI can streamline administrative tasks, such as grading and feedback, enabling educators to redirect their focus towards more impactful instructional activities (Chen et al., 2020). Intelligent tutoring systems powered by AI offer personalised guidance to students, aiding them in overcoming learning challenges and improving their overall performance (Xu & Ouyang, 2022). Additionally, AI's data analysis capabilities empower educators to make informed, data-driven decisions, allowing them to customise teaching strategies based on the specific needs of their students.

The quality of education is further enhanced through AI's capacity to provide access to a diverse array of educational resources. AI-driven platforms recommend personalised learning materials based on individual learning styles and preferences, thereby encouraging students to explore and engage with a variety of resources, deepening their understanding of the subject matter (Chen et al., 2020).

The assessment process undergoes a positive transformation with the introduction of AI. Through the analysis of student performance data, AI technologies offer immediate feedback, enabling students to monitor their progress and identify areas for improvement (Chen et al., 2020). AI's ability to detect patterns in student responses allows teachers to intervene promptly, offering targeted support and ensuring a more effective learning process.

However, the incorporation of AI in education is not without its challenges. Disadvantages include concerns related to transparency, accountability, safety, and ethical standards (Vinuesa et al., 2020). Issues such as potential biases, centralization of power, and the reduction of student agency in the learning process necessitate careful consideration (Selwyn, 2022; Seo et al., 2021). The introduction of AI in education raises critical questions about

societal impacts, emphasising the importance of addressing biases and ethical considerations (Sudjitjoo et al., 2022). The need for education and awareness among physicians in the context of medical education also emerges as a pertinent concern (Dumić-Čule et al., 2020).

Generally speaking, while AI brings about significant benefits in education, its integration requires a nuanced approach that acknowledges and addresses potential disadvantages. Striking a balance between leveraging the advantages of AI and mitigating its drawbacks is crucial for the ethical and equitable implementation of AI in educational settings. In addition to these, the upcoming section of this chapter attempts to examine the benefits and drawbacks of incorporating AI in language learning, extending the discourse on AI's impact from the general educational arena to the specific domain of language acquisition.

Building upon the understanding that the ethical and equitable implementation of AI in education demands a careful balance between its advantages and disadvantages, the exploration of AI in language learning serves as a natural progression. The insights gained from assessing the broader implications of AI in education become the foundation upon which the specific dynamics of AI's role in language acquisition can be examined and scrutinised. By establishing this connection, the narrative seamlessly transitions from the general considerations of AI in education to the intricacies of its application in language learning. This transition underscores the importance of a comprehensive exploration of AI's impact, acknowledging both its potential benefits and the challenges that may arise, with a particular focus on language education.

2.5.3. Benefits and drawbacks of using AI in language learning.

The integration of artificial intelligence (AI) into language learning is marked by a spectrum of notable advantages. Primarily, AI contributes to the optimisation of language learning processes by harnessing advanced learning algorithms and extensive datasets. This

technological prowess enables AI to excel in tasks such as image interpretation and natural language processing, thereby enhancing the accuracy and speed of language acquisition (Ahuja, 2019; Hirschberg & Manning, 2015). Leveraging these capabilities, AI-powered language learning tools offer a personalised educational experience, accommodating students' individual pacing and learning styles (Harry, 2023). This tailored approach emerges as a catalyst for improved student outcomes and heightened language proficiency.

Moreover, AI introduces a dimension of continuous learning and adaptability to language acquisition. Through sophisticated algorithms, AI analyses learner data, furnishing personalised feedback and recommendations. This iterative process aids learners in identifying their strengths and weaknesses, empowering them to refine their strategies and optimise their language learning journey (Jawaid, 2023). The dynamic nature of this adaptive learning approach holds the potential to elevate the overall effectiveness of language learning.

A compelling advantage of AI in language learning lies in its capacity to replicate real-world language use. AI-powered language learning tools adeptly simulate authentic language contexts, providing learners with immersive experiences to practice their language skills in realistic scenarios (Ali, 2020). This practical exposure enhances language fluency and cultivates effective communication skills in diverse real-life situations. Furthermore, AI acts as a facilitator for language learners by granting access to a diverse array of resources and materials. AI-powered platforms curate and recommend relevant learning materials, encompassing texts, audio, and video resources, tailored to the unique needs and preferences of individual learners (Pokrivčáková, 2019). This curated exposure enriches the learning experience, offering learners a comprehensive and varied linguistic landscape.

However, it is imperative to acknowledge the existence of challenges and limitations associated with the integration of AI into language learning. Notably, AI may encounter

difficulties in replicating the intricate cultural and contextual nuances integral to language learning (Vall & Araya, 2023). Additionally, recognising the indispensable role of human interaction and feedback in language acquisition is crucial, positioning AI as a complementary tool to human instruction rather than a complete replacement (Vall & Araya, 2023). These limitations that are created due to the integration of artificial intelligence (AI) into language learning, can attribute to the emergence of discernible disadvantages. A prominent challenge lies in the inherent limitation of human interaction within AI language learning tools. Predominantly relying on automated responses, these tools often lack the capacity to furnish personalised feedback and engage in meaningful conversations (Vall & Araya, 2023). Consequently, this deficiency hampers the development of crucial interpersonal and communication skills, which are fundamental in the realm of language learning (Pokrivčáková, 2019).

Another notable drawback is the substantial reliance on extensive datasets for training AI language models. The efficacy of these models hinges on copious amounts of data to learn and generate accurate responses (Vall & Araya, 2023). However, the availability of such data may be constrained, particularly for less commonly taught languages or specific language contexts. This limitation can result in AI language learning tools delivering responses that are less accurate or relevant (Vall & Araya, 2023).

Moreover, AI language learning tools may grapple with the nuanced understanding and interpretation of contextual aspects of language. Beyond grammar and vocabulary, language encompasses cultural and situational factors (Vall & Araya, 2023). AI models may encounter challenges in accurately deciphering and responding to these nuances, potentially leading to misunderstandings or inappropriate responses (Vall & Araya, 2023).

Finally, some ethical concerns also form another dimension of the disadvantages

associated with the use of AI in language learning. AI models have the propensity to perpetuate biases embedded in the training data, resulting in biased or discriminatory language learning experiences (Mehrabi et al., 2021). This perpetuation of biases has the potential to reinforce existing inequalities and impede the cultivation of inclusive language learning environments (Akgun & Greenhow, 2021). This study, however, does not intend to focus too much on these, as not the entire spectrum of AI technologies is planned for use. Instead, it will focus on the use of AI chatbots, the merits and drawbacks of which will be discussed in the next section of the chapter.

2.5.4. Benefits and drawbacks of using chatbots in language learning.

While studies in existing literature have established the potential positive and negative aspects of applying artificial intelligence in learning, the use of artificial-intelligence operated chatbots poses another interesting topic for further examination. While chatbots, and notably the chatbots that are being used for the purposes of this study, are connected to artificial intelligence, studies have shown that they possess their own characteristics that can influence the overall learning experience either in a positive, or negative way.

According to existing literature, using chatbots in language learning could potentially offer several benefits. An early study by Winkler & Söllner (2018) suggests that chatbots can provide individualised support to students, especially in large-scale learning scenarios with a high number of students per lecturer. This personalised assistance can help address the specific needs and challenges of each learner. Additionally, chatbots have been found to be quite effective in stimulating students' learning interest (Chen et al., 2020). This study has shown that chatbots have the ability to further enhance student engagement and motivation in language learning. By providing interactive and conversational experiences, chatbots create a more dynamic and immersive learning environment.

An interesting piece of information about chatbots that are equipped with advanced natural language processing tools is that they can understand complex conversations and respond with a significant level of depth, compassion, and even humour (Chocarro et al., 2021). This level of interaction between the user and technology can help elevate the overall experience of the user and makes the language learning process more enjoyable and interactive. Another important benefit of the chatbots is that they offer the advantage of access to language learning resources anytime, anywhere (Haristiani, 2019). Learners can engage with chatbots at their own convenience, allowing for flexible and self-paced learning. This accessibility promotes continuous learning and enables learners to practice their language skills regularly. Finally, chatbots can promote students' interaction during the language learning process (Huang et al., 2021). By engaging in conversations with chatbots, learners can practice their speaking and listening skills in a supportive and non-judgmental environment. This interactive nature of chatbots facilitates language practice and helps learners build confidence in using the target language.

While these advantages contribute to a more effective and enjoyable language learning experience, there are also some drawbacks that should not be disregarded. One of the main drawbacks appearing in the existing literature is the steady decline in student interest over time compared to human learning partners (Winkler & Söllner, 2018). While chatbots may initially engage students, their inauthentic nature as conversational practice partners can lead to a loss of interest (Fryer et al., 2017). This lack of authenticity can hinder the development of conversational skills and limit the effectiveness of language learning (Huang et al., 2021). Another disadvantage that needs to be considered is the limited ability of chatbots to provide personalised and adaptive learning experiences. Chatbots often lack the ability to tailor their responses to individual learners' needs and preferences (Kuhail et al., 2022). This can result in a

one-size-fits-all approach that may not effectively address the specific learning goals and challenges of each student (Neo, 2022). Additionally, chatbots usually struggle to provide accurate and nuanced feedback on language usage completely on their own, which is crucial for language learners to improve their skills (Huang et al., 2021).

Furthermore, the reliance on chatbots as language learning tools may lead to a reduction in human interaction. According to a study by Haristiani (2019), language learning is a social process that benefits from real-time communication and interaction with native speakers or proficient language users. Chatbots, being artificial entities, cannot fully replicate the nuances and complexities of human conversation. They, therefore, only manage to limit the opportunities for learners to practice and develop their language skills in authentic contexts (Fryer et al., 2017). Lastly, the effectiveness of chatbots in language learning may vary depending on the design and implementation of the chatbot itself. Some studies have found that chatbots lack certain features that are valued by language learners, such as simplicity, quick practice opportunities, gamification features, accessibility, and cost-free usage (Klimova et al., 2023). Without these features, chatbots may not fully meet the needs and expectations of language learners, limiting their effectiveness as learning tools.

As a general summary, despite the transformative potential of AI-related technology in enhancing language learning, a nuanced understanding of its disadvantages is imperative. The limitations encompass the deficiency in human interaction, the reliance on substantial data, challenges in understanding contextual nuances, and ethical concerns related to biases. To harness the benefits of AI in language learning effectively, it is crucial to address the disadvantages that have been discussed so far and ensure a judicious and ethical integration that promotes inclusive and effective language learning experiences. Consequently, this project endeavors to illuminate the potential hazards associated with the integration of AI into the

process of effective language acquisition. Despite the project's reliance on the ethical and judicious application of AI tools aimed at enhancing participants' linguistic proficiency, it remains committed to affording participants the platform to articulate their apprehensions concerning the potential risks inherent in leveraging AI during the learning stage. Prior to delving into participants' concerns, it is imperative to elucidate the methodology behind the implementation of AI in this project. Therefore, the upcoming chapter will expound on the development and utilisation of materials and other tools, providing a comprehensive understanding of the project's approach to incorporating AI in language acquisition.

Chapter 3: Methodology

3.1 Introduction

This present chapter describes all the steps that have been made concerning the overall designing, planning and running of this research project. The first part of the chapter attempts to provide a thorough look at the research approach that was followed, along with the variety of tools that were used for the collection of the data. The next part of the chapter focuses on the evolution of the study, beginning from the pilot study and concluding on how the final study was visualised and conducted in the end. Finally, some limitations are being discussed at the end of the chapter, which focus mostly on the methodological development of the study, including difficulties that occurred later in the project.

The following table summarises the research questions, and the data collection tools that are being planned for the particular research project. While the research questions have been previously mentioned in the Introduction chapter, this table provides information on the data collection tools that were used from the investigator.:

Table 3.1: Research Questions and Data collection tools per question

Research questions	Data collection tools
What are the written grammatical errors advanced Greek learners of English produce?	Data collected from the thirteen teaching sessions and the twelve pieces of homework. (quantitative data) Questionnaire to the participants (learners), provided at the end of the teaching sessions. (qualitative data)

What is the learners' perception regarding producing and correcting written grammatical errors of English?	Questionnaire to the participants (learners), provided at the end of the teaching sessions. (qualitative data)
Why is it important for adult Greek learners to study English and reach a high standard level?	Questionnaire to the participants (learners), provided at the end of the study. (qualitative data) Interviews conducted at the end of the teaching sessions. (qualitative data)
How effective is the application of computer-assisted and mobile-assisted language learning, including AI apps in correcting advanced adult Greek learners' grammatical errors?	Data collected from the thirteen teaching sessions and the twelve pieces of homework. (quantitative data) Data collected from the AI-chatbot interactions. (quantitative data)

3.1.1 Research Approach

In developing the design of the study, several crucial elements are taken into consideration, as highlighted by Crotty (1998). These elements include the paradigm world view, the methodological approach, and the methods of data collection. For this particular study, the chosen paradigm is pragmatism, which emphasises the importance of research consequences and prioritises the questions asked over the specific methods employed. This informed the epistemological stance of the study, focusing on practicality and the collection of data relevant to address the research questions at hand.

To gather data for this study, various methods of data collection are employed. These

methods include tasks, chatbot interaction transcripts, interviews, questionnaires, and field notes taken during the teaching sessions or interactions between the researcher and the participants. By utilising multiple data collection methods, the study can capture a diverse range of perspectives and gather rich, multi-faceted data. This approach enhances the validity and reliability of the findings by allowing for triangulation and ensuring data saturation.

Moreover, the use of tasks provides an opportunity to assess participants' performance and obtain quantitative data, while chatbot interaction transcripts allow for the analysis of natural language interactions and the exploration of qualitative insights. Interviews provide an in-depth understanding of participants' perspectives, allowing for the exploration of their thoughts, experiences, and emotions. Questionnaires offer a standardised approach to collect data from a larger sample, enabling statistical analysis and generalizability to a certain extent. Lastly, field notes serve as valuable observational data, capturing real-time details and contextual information that can enrich the study's analysis.

By employing this diverse range of data collection methods, the study aims to generate a comprehensive and holistic understanding of the research topic, capturing both the breadth and depth of the phenomenon under investigation. This approach aligns with the principles of pragmatism and mixed methods research, emphasizing the importance of addressing research questions using a pragmatic lens and employing a combination of deductive and inductive thinking to gather and analyse data from various sources.

3.1.2 Methodological approach

The present study is a mixed methods research design. Mixed methodology research involves 'philosophical assumptions that guide the direction of the collection and analysis and the mixture of qualitative and quantitative approaches' (Creswell & Clark, 2007, p. 5). The use

of mixed methods research can ensure a higher level of data validity, since the collected data is looked at from different points of view and allows a wider range of interpretation of the findings. In addition, constructivism has been chosen as the theoretical framework of the study, due to the nature of the work that has been done during the study. The interactions between the participants and the AI chatbots have ultimately enabled the participants to construct knowledge through assimilation of the information received in the learning sessions (Aeni, 2023), resulting in the occurrence of cognitive constructivism, one of the two available forms of constructivism. Constructivism highlights the importance of participation both during learning and during the engagement of data collection tools, and this has informed the research design and data collection tool of this project.

In order to a) successfully answer the research questions proposed, b) test the effectiveness of the proposed forms of technology in regards to removing fossilisation, and c) learn about the learners' perception towards the mistakes they make, it was necessary to triangulate the data. According to McDonough and McDonough (1997) the combination of different research methods results in further credibility and in a wider range of the findings' possible and acceptable interpretations. Considering this, three different data collection methods would be employed in order to analyse, compare and contrast the findings and their results. Possible validity issues will be dealt by using both **quantitative** and **qualitative** methods.

By quantitative data, we are talking about all the information that includes statistical and numerical data (Allwright and Bailey, 2004). This data was gathered by the questionnaire responses, and the analysis of the progress learners have made over the course of the teaching sessions. In terms of qualitative data (non-numerical data) a more in-depth analysis is provided. In this study, qualitative data is depicted through the various points of view that emerge in response to the learners' attitudes towards making mistakes, and the frequency of the self-

correction - a phenomenon that indicates the overall proficiency and understanding of an aspect of language. This, in turn, decides whether an error is a product of fossilisation.

Of course, while this data does provide the basis of reaching a safe conclusion regarding the original study hypothesis, it might still not be enough. As such, a third type of data collection is required for the successful triangulation of the data. This data collection method utilises structured interviews, where the participants have to provide answers to questions that emerge during the process of analysing the collected data, allowing the more accurate analysis and representation of the findings. These interviews took place towards the end of the main study and attempted to provide a more accurate link to the findings of the study.

3.2 Data Collection Tools

This part of the chapter presents all the qualitative data collection tools that were used for the collection of data. These include a questionnaire that was given to the participants at the end of the teaching session, as well as a series of interviews that took place at a later date within the study. Some basic and theoretical information will be provided regarding the data collection tools in this section, while more information will be provided in the upcoming sections of this chapter (Sections 3.3.2 and 3.3.3)

3.2.1 The Questionnaires

In order to collect quantitative data for the purposes of this study, a structured questionnaire was designed. The questionnaire serves two distinct purposes: to investigate their personal views and approaches towards making mistakes, and to explore the perceived importance of reaching a higher level of English within their social, educational, and employment contexts (Smith, 2020; Oppenheim, 2000).

Questionnaires offer several advantages in research methodology. Firstly, they facilitate the gathering of responses in a standardised manner, ensuring that the data collected is more objective compared to other methods, such as interviews. The use of standardised scales and response options allows for consistent data collection and analysis across participants, enhancing the reliability and replicability of the findings (Fowler Jr., 2013). Secondly, questionnaires enable researchers to collect information more efficiently and quickly. Compared to other data collection methods, such as interviews or observations, questionnaires are less time-consuming and resource intensive. Researchers can distribute questionnaires to a larger number of participants simultaneously, allowing for a broader representation of the target population and facilitating the collection of a substantial amount of data within a shorter timeframe (Oppenheim, 2000). Furthermore, one of the key advantages of using questionnaires is the ability to gather data from a large number of participants. This not only enhances the statistical power of the study but also increases the generalizability of the findings to a wider population. By obtaining responses from a diverse range of individuals, the researcher can capture a variety of perspectives and experiences, leading to a more comprehensive understanding of the research topic (Fowler Jr., 2013; Stangor, 2014).

The questionnaire items can be designed to elicit specific information, allowing for quantitative analysis and comparisons across participants (Smith, 2020). In the context of this study, the structured questionnaire provides a standardised framework to investigate the learners' personal views on making and addressing the mistakes they make. Their perceptions of the importance of achieving a higher level of English were originally considered for the participants' questionnaire and were intended to be asked only once for the data collection stage. Ultimately, this question was asked directly in the interviews, while more indirect questions that would reflect similar responses were added -and asked- in the questionnaire.

To ensure the validity and reliability of the questionnaire, rigorous procedures can be followed during its design and administration. This involved the conduct of a pilot study, in order to assess the clarity and comprehensibility of the questionnaire items, as well as employing established scales or validated measures whenever applicable. A look at section 3.3.4 provides more information regarding the original exploratory tasks that were used, as well as their significance in the design and structure of the final study. Confidentiality and anonymity also played a major role in the recruitment of the participants in the pilot study, as they can encourage participants to provide honest responses, further enhancing the quality of the data obtained (Oppenheim, 2000).

The pilot questionnaire also proved to be the basis for the questionnaire that was used in the final study, and was originally based on the investigator's previous studies, using the questionnaires that were made as a template for the current one(s). The final questionnaire remained structured, with closed questions and Likert-scale responses, though the numerical representation of the Likert-scale was replaced by carefully phrased responses that still maintain a level of variety and order between each other. This was done to ensure that the participants have a better understanding of the contents of each question, and that they would be able to provide clearer and more accurate responses.

To sum up, the structured questionnaire serves as a valuable tool for collecting quantitative data in this study, providing a standardised and efficient approach to gather information from a large number of adult Greek learners of English. The use of questionnaires contributes to the reliability of the responses, allowing for statistical analysis and the generation of valid conclusions regarding the learners' perspectives on mistakes and the importance of English proficiency.

3.2.2 Interviews

Interviews play a crucial role in the data collection process, particularly in this research project, where their significance lies in triangulation and comparison with the questionnaire responses. Semi-structured interviews are employed to complement the data triangulation, aiming to provide a deeper understanding of phenomena that may not be directly observable, such as the personal viewpoints of learners regarding the use of technology to improve their mistakes. In this study, the use of interviews for the purpose of triangulation of data is to enhance the validity of the findings by comparing the responses collected from the questionnaires with those obtained from the interviews that were conducted at a later date. This methodological approach aligns with the principles of qualitative research, as highlighted by Campbell and Friske (1959), who emphasise the power of triangulation in demonstrating validity.

Although it is generally preferred to conduct interviews in the participants' first language to ensure the quality and quantity of data provided (Mackey & Gass, 2011), in this study, all interviews are conducted in English. This decision is based on the assumption that the participants are advanced speakers of the English language, eliminating the need for translation. Conducting interviews in English offers several advantages, such as easier accessibility of the transcripts for discussion and analysis purposes. Moreover, it saves a considerable amount of time that would otherwise be spent on translation, allowing more focus and resources to be allocated to other aspects of the project.

By conducting interviews in English, the research aims to capture the participants' perspectives directly, without the potential loss of meaning or nuances that may occur through translation. It also ensures consistency in the language used during the interviews, enabling a

more accurate comparison and analysis of the data collected. However, it is essential for the researcher to consider potential language barriers and adapt the interview process accordingly, ensuring that participants feel comfortable and able to express their thoughts effectively.

3.3 Analysis of the subjects

3.3.1 The participants

The participants who took part in this study, both in the teaching sessions and the questionnaire, were Greek native speakers who were studying English as a foreign language, while their age group involved adult learners. The participants needed to be holders of a recent IELTS certification of grade 7 and beyond, or C1/C2-level certificated. According to the Common European Framework of Languages – “CEFR” classification, a C1 or C2-level user of English is proficient user of the language. More specifically:

C1 users of English can understand long and difficult texts, and their meanings, whether these are explicit or hidden. They are able to express fluently and spontaneously, without spending too much time thinking, while at the same time they are able to use a variety of words and phrases that can facilitate speaking in different contexts, such as social, academic and professional. Finally, they are able to produce clearly written, detailed and well-organised pieces of written work, while at the same time they are able to use cohesive devices, connectors and mechanisms to present information in a well-structured way. C2 users of English have absolutely no difficulty understanding everything they hear or read. They are able to summarise information from different oral and written pieces of information, expressing arguments and detailed reports in a coherent presentation. Finally, they are able to communicate fluently and without taking time to think, even at complex situations and contexts. No matter what means of expression they

choose, they are always able to convey their message with precision, and be always meaningful, despite the context of communication and the different meanings that are implied or directly expressed.

The research was carried out with employed professionals, who may or may not be using the language for work purposes, and university students, attending EAP courses at their respective bachelor's degree programmes in Greece, with participation of Master's degree students expected as well. A Grade 7 in the IELTS exam, or the owning of a C1/C2-level certification indicates that the student's level of English is at least C1, according to the CEFR, meaning that the possible mistakes learners make are, possibly, a result of fossilised knowledge, and not a result of inadequate instruction.

Ultimately, a total number of 34 participants were recruited for the study – 18 male participants, representing 53% of the participant pool, and 16 female participants, representing 47% of the participant pool. All of them ranged between 20 and 35 years old ($M=30.7$). They have all been studying English as a Foreign Language between 7 and 11 years ($M=8.6$). Out of them, 18 participants attended the first study group (from October 2021 – February 2022) and 16 attended the second study group (from March 2022 – June 2022). Most of the first group of participants were recruited through the assistance of EFL colleagues using Greek EFL teacher groups on Facebook, while the rest of the participants in the first and second study group were recruited through the Discord channel of a Greek video gaming community. Finally, 20 participants took part in the interviews, which took place in May and June 2023.

3.3.2 Questionnaires

Only one questionnaire has been designed for the purposes of this research project and was given to the participants of the study at the end of their respective study group sessions.

According to Rasinger (2008) the most important step in designing a successful questionnaire is make sure that the participants get to understand the questions, while the next important step is to ensure that the participants answer these questions to the best of their knowledge. Therefore, during the initial planning of the questionnaire, it was necessary to create clear and easy-to-understand questions that would not sound vague or cause ambiguity. After all, the ability to ask good questions shows precision – trying to show off by using inappropriate phrasing can often lead to the opposite result.

A good alternative to measure attitudes with questionnaires is to implement multiple-choice questions, which are questions that provide a range of possible answer options. Some of the questions in the questionnaire required only one answer, whereas some others required two or more. The vocabulary used in the description was to ensure that the answers would be clear and cause no confusion to the respondents, while some of the questions were designed to include notifications about the possible existence of more than one answers.

Apart from the multiple-choice questions, questions that required the use of Likert scales were used as well. Likert scales are “a related and equally popular instrument for measuring attitudes... Respondents are asked to indicate their opinion/attitude along a continuum of items. However, instead of using pairs or opposing adjectives, Likert scales ask respondents to indicate agreement or disagreement with a particular issue, usually on a scale of 5 to 7, depending on degree of detail required by the researcher”. (Rasinger, 2008:62) Likert scale items needed to be statements which, in this study, were trying to measure the reasons why teachers use technology in carefully structured questions. Questions that depend on personal views (e.g. “Do you think that.... is useful?) were not used, because we would not be able to talk about pure Likert scale items.

It should be noted that the questionnaire, while focusing on different aspects of the research project, is quite compact and is not expected to take too much time for the learners to go through the questions (10 questions were designed for the draft version, though 15 questions were asked in the final version of it).The use of technology and the implications of applying artificial-intelligence in various levels of the learning process, as well as the perception of making mistakes and the areas of the language that are mostly affected by their mistakes are being investigated in this questionnaire. The first draft of the questionnaire was created based on the questionnaire created by the investigator of the study during his MA thesis. It was piloted and edited using the assistance of a British EAP colleague and a Greek EFL/EAP colleague working in Spain. Their contribution and suggestions assisted in the creation of the final version of the questionnaire.

3.3.3 Interviews

Interviews are a common research tool that is used extensively in research projects. Researchers tend to employ interviews in their work due to the fact that they can provide a source of rich and detailed information from participants in a variety of research projects, fields and domains.

One of the main advantages of using interviews is that they allow researchers to obtain detailed and more accurate information from participants (Denzin & Lincoln, 2005). Contrary to the use of survey questionnaires that may restrict the range of responses to predefined options, interviews allow participants to express themselves more fully and in their own words. This means that researchers can gain a deeper understanding of the participants' thoughts, experiences, and perspectives on a topic.

In addition, interviews are useful in obtaining information from participants regarding

more sensitive or complex issues that may be difficult to capture or phrase using other research methods (Fontana & Frey, 2003). For example, in healthcare research, interviews can be used to explore patient experiences and perspectives on sensitive topics such as end-of-life/comfort care or mental health conditions (Happ et al., 2011). Interviews permit researchers to clarify and expand on the responses of participants, which can help to uncover deeper insights into the topic that is being studied (Galletta, 2013). This way, researchers are enabled to explore areas that they had not been considered before the study began, which can eventually lead to new and unexpected discoveries. Interviews can also be used to explore more complex and debatable issues such as attitudes towards education or political beliefs that are difficult to measure using traditional quantitative research methods. If anonymity is ensured, then interviewees are more likely to contribute in such interviews more accurately.

Finally, interviews are a flexible research tool that can be tailored to the specific research question and the characteristics of the participants (Kvale & Brinkmann, 2009). For example, researchers can use structured interviews, which involve a set of specific, and set questions, or unstructured interviews, which provide a greater sense of liberty to the interviewee and allow for greater flexibility in the conversation. Interviews can also be conducted through phone calls, face-to-face, or online, depending on the needs of the study and the availability of the interviewee.

For the purposes of this study, interviews were deemed necessary only after moving into the analysis and the discussion of the results. While the collected quantitative data was more than enough to support the research hypothesis and sustain the research questions, it was not the same with qualitative data that was collected from the questionnaires. Therefore, and in order to complete the data triangulation process, a series of interviews were arranged. These interviews took place face-to-face in Athens, Greece, with the sole purpose of further validating and

enforcing the conclusions that have been reached from the data that had already been collected.

The use of Stimulated Recall was originally considered to be used due to the fact that the interviews had been delayed, though it was later disregarded. According to Audétat et al. (2023), Stimulated Recall is a research method that involves research participants to recall their thinking during a point in the study. While it can provide a deeper understanding of the participants' behaviours and thinking patterns, it generally requires the use of video materials – a fact that would not be possible with these interviews. Therefore, it felt necessary to simply look at the performance records of the participants at different records of the study and remind them of the grammar points they performed really well, or not as well as they would have liked. This proved to be a great way to help them recollect key moments from the main study. It also proved a great asset in eliciting their own points of view regarding the level of difficulty or challenge of some grammatical phenomena that had been practiced in the main study. This was beneficial for supporting the existing literature regarding the challenging areas for Greek learners, something that we do not currently have enough information to support on a literature basis.

Due to a gap between the main study and the interviews' stage, semi-structured interviews were employed for this research project. The reason for this is that semi-structured interviews have the potential to build better rapport between the researcher and the participant. This method would permit the interviewer to establish a more relaxed and comfortable atmosphere during the interview, which, in turn, could increase the willingness of the participant to recollect and share more accurate and relevant information (Smith & Osborn, 2008).

The interviews were thus designed having the previous parameters in mind. The questions asked were based on the items of the questionnaires and was designed with the assistance of a British EAP colleague and a Greek EFL/EAP colleague working in Spain. A pool

of between eight to ten questions was used for the conduct of the interview, though some of them were adapted on-the-spot, with some questions ending up with more than twelve questions being asked. Most of the interviews lasted for 10-12 minutes, with a small number of them lasting for up to 15 minutes in total. Semi-structured interviews proved that they led to a more engaging and productive interview, as well as improved data collection and analysis. Relevant data was collected and associated with the respective research questions, providing a more accurate picture of the study's relevance in the literature and potential studies that focus on Greek learners.

3.3.4 Piloting – Exploratory tasks

Once the materials that will be used for the purposes of a study have been designed, it is important to see if it can successfully measure what it is supposed to measure. This can be determined through the piloting stage, during which the study is run by a few participants in order to detect possible flaws.

Fowler (2002) suggests a pilot sample of between twenty and fifty people, while Burton (2000) says that this number is impossible for student researchers with limited resources. The piloting of the teachers' questionnaire was made possible thanks to the co-operation of two professional English as a Second Language teachers, who have shown genuine interest for this particular project since its initial stages of conception. Coming from different cultural backgrounds (United Kingdom and Greece) they were able to provide some ideas related to its content, and some possible questions that could be included for the participant teachers. In addition, the piloting stage pinpointed some wording issues and, in some cases, structural problems, that were successfully fixed before the questionnaire was submitted for ethics approval. Some more questions are being kept aside, in case the research project deems them necessary.

The piloting stage took place from July to October 2020. Two pilot sessions were conducted in July, with one taking place in August, September and October, respectively. The purpose behind these sessions was to:

- a) test the technological tools that are expected to be used, and
- b) make a decision on the lesson paradigm(s) that will be followed in the data collection stage.

The first three sessions lasted about 80-90 minutes, while the remaining sessions lasted for 100 minutes each. It should be noted that the first three sessions consisted of the instruction stage (where the phenomenon was presented), and the practice stage (where they had the opportunity to work on the activities that were provided to them). No pre-teaching activities were planned for the first three sessions, but they were added in the fourth and fifth sessions. The reason for these choices was an attempt to decide on the timings of the data collection stages sessions, as well as the lesson paradigm. The sessions were taught using Microsoft Teams, which seemed to be working well in terms of connection. The tasks that were given to the participants were taken from a C1-level coursebook (an example is available on the Appendix) and were used as a primary source of practising material for these sessions. No other planned tools (AI chatbots, Google Classroom) were used during that stage, due to the la.

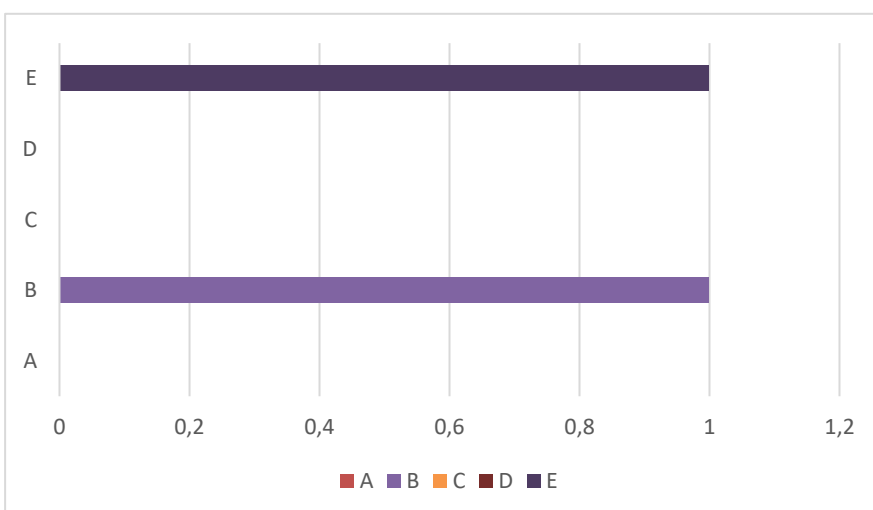
Of course, the most important aspect of piloting is associated with the use of tools for the conduct of the research project. The first important contribution was to measure the strengths and the weaknesses of some linguistic areas that can cause difficulties to Greek learners, according to existing literature. Some of the areas really caused issues, and some others proved to be of no particular issue to the participants. The following table provides summarised information regarding the sessions and the outcomes of each session:

Table 3.2: List, focus and outcomes of sessions

List of sessions	Focus of the session	Outcome of the session
Session 1	Perfect tenses	Successful. The number of errors kept decreasing as we moved towards the end of the session.
Session 2	Prepositions	Successful. The number of errors kept decreasing as we moved towards the end of the session.
Session 3	Articles	Unsuccessful. Most of the answers were correct from the beginning to the end of the session.
Session 4	Conditionals	Successful. Being a difficult area in my personal experience with Greek learners, a bigger number of errors was reported in the earlier stages, which kept decreasing later on.
Session 5	Reported Speech	Successful. The number of errors kept decreasing as we moved towards the end of the session.

Moving forward, the following tables show the number of mistakes that the participants made in two different cases:

Table 3.3: Number of mistakes in Trial 3

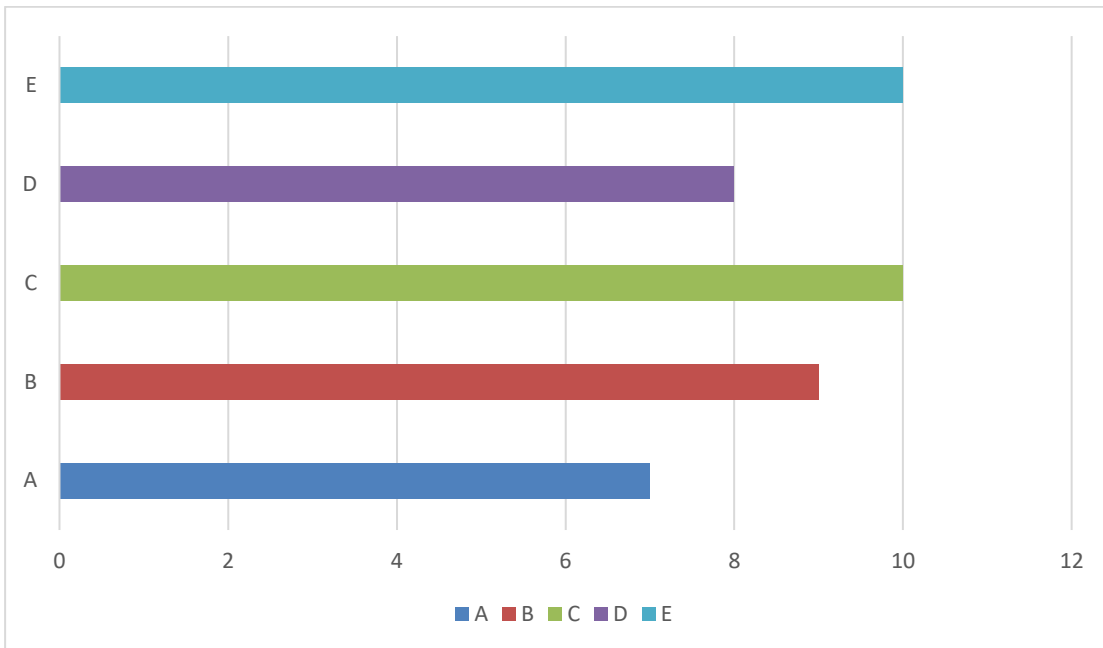


Trial 3 focused on the use of articles. The number of mistakes displayed here comes from a total of 133 separate items. While

articles are being mentioned in literature, they do not seem to be of particular issue with these advanced learners – a trait that might be shared with the potential participants in this research. It should be noted that there was no pre-teaching before the first activity, and the mistakes that

appeared could have also been slips.

Table 3.4: Number of mistakes in Trial 4



Trial 4 focused on the use of conditionals. The number of mistakes displayed here comes from a total of 97 separate items. The use of conditionals seems to be an area of difficulty for Greek learners of English, especially the use of the Third Conditional, and Mixed Conditionals.

Contrary to the previous trials, this trial used the first activity as a pre-test activity, after which the teaching occurred. While there was some improvement in the second task, some mistakes kept occurring in the following tasks, but at a limited capacity. It is possible that the correct design of the actual teaching sessions, and the full implementation of the proposed tools might lead to better results.

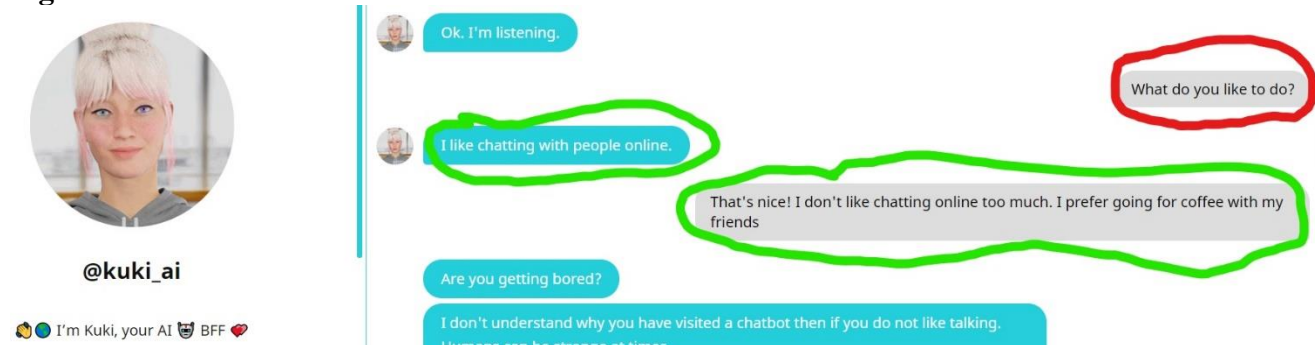
3.3.5 Pilot – Working with the Artificial Intelligence applications.

After obtaining approval from the ethics committee, a new phase in piloting began – the testing of the artificial intelligence chatbots. This was even more crucial than the series of the exploratory tasks that was undertaken the previous year, since the notion of artificial intelligence belongs to the core of this study’s conception. Over the course of approximately two months, the same five volunteers joined the study, in order to trial the chatbots and their effectiveness in detecting fossilised patterns of language, or any instances of self-correction.

During this stage, the participants had to communicate with the artificial intelligence chatbots using specific prompts of communication that were provided prior to their interaction. All five participants used their personal computers to interact with the chatbots. After completing their sessions, which lasted for 30 minutes, as planned, they forwarded their transcripts for evaluation. Those who decided to use Kuki were able to access the application using a variety of login methods, whereas those who decided to use Replika had to register using their email address. However, the ability to login on the application allows users to store their conversation history, meaning that participants in the study could always forward a specific part of their interaction, if it is needed in the future.

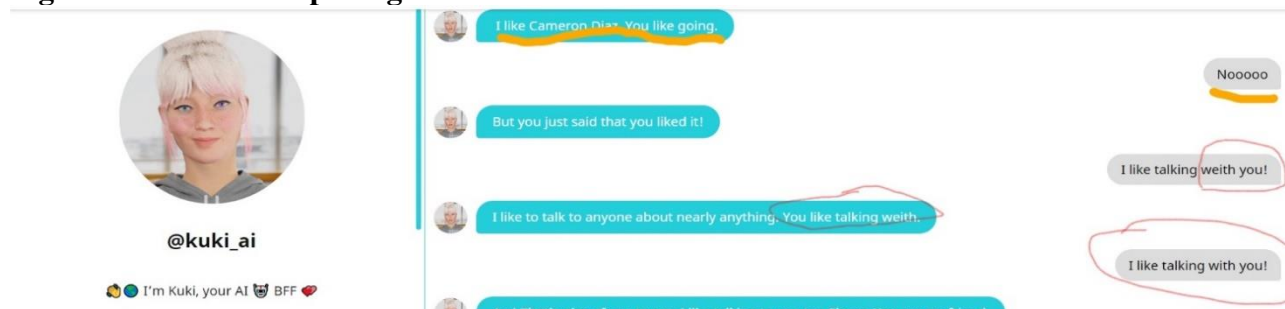
The interaction with the chatbots seems to be successful at first glance. While no important mistakes were made during the participants’ interaction, it was interesting to note the accuracy of the interactions in Replika, and the self-correction attempts in Kuki, showing an understanding of proper language use that is not associated with fossilisation. However, this session raised some other issues, such as the attempt of the users in Kuki to change the conversation and get back on track in cases where Kuki did not seem to fully cooperate with the user and continue the conversation effectively. Some examples of the participants’ interactions have been selected to showcase the different forms of interaction between users.

Figure 3A: Case of self-correction



This shows an instance where the participant uses the structure like + full infinitive to indicate a general preference, rather than a preference in a very specific context. Kuki responds using the correct structure (verb + gerund), in which the learner responds by using the correct structure in their next statement.

Figure 3B: Case of a spelling mistake



This showcases a very interesting example, one that is hoped to be observed in the final study. The participant has made a spelling mistake (*weith, instead of **with**), which causes a case of misunderstanding, as the application does not seem to be able to proceed with communication. The learner seems to understand the situation, and replaces the incorrect form with the correct one. Interestingly though, the application moves on further correcting the learner, by suggesting that the correct preposition in this case is **to**, rather than **with**. The learner

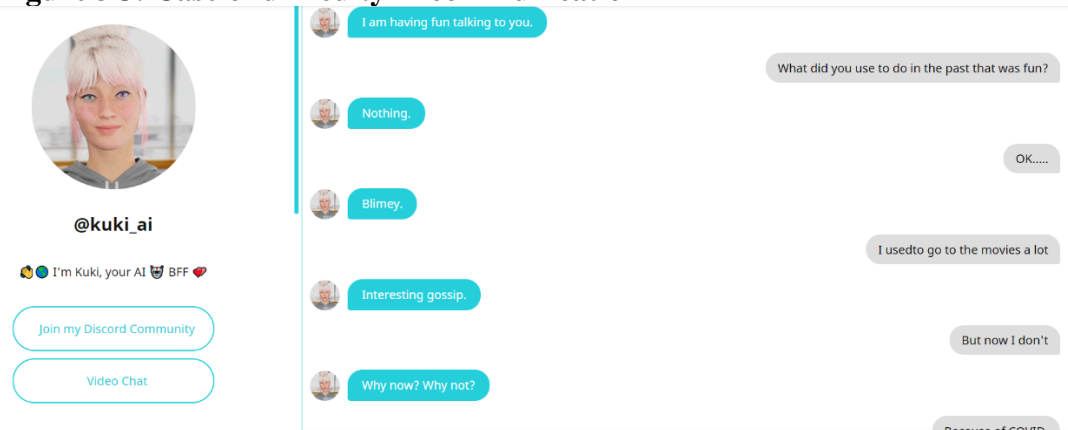
does not seem to realise this and moves on with the interaction. This could be attributed to a fossilised pattern in their output, though more data is required to reach a safer conclusion, and to observe whether the learner manages to improve when they practice prepositions.

A similar case also occurs in Replika. The user in this case misspelled the word **cousin** (*casin), in which case Replika gave a rather confusing response. The learner realised that they made a slip while typing and provided the correct form of the word, in which case Replika also seemed to respond in the right way:

- I will go to Thessaloniki next month
- I'd love going there.
- Do you know what is it?
- *Nods* I do.
- What is it?
- Thessaloniki is the largest city in Greece and the most beautiful one.
- wow! it is a beautiful city, but not the largest one!
- *Laughs* You're right.
- Athens is the largest
- That is very, very true.
- I am going to visit my casins
- Oh, okay! I hope you enjoy it.
- sorry, I mean cousins
- Oh, no worries.
- Do you want to know about my cousins?
- Yes please!

The use of chatbots in this situation also revealed some potential difficulties with the effective communication between the application and the user. Specifically, the chatbot responded in a way that was completely irrelevant with the previous instances of communication. The learner attempted to redirect the course of interaction, though this is something that is more frequent with Kuki, rather than Replika. The following example showcases that particular difficulty in more detail.

Figure 3C: Case of difficulty in communication



While the learner attempted to communicate with the application on a given prompt, the chatbot did not function as expected. By providing very short responses, it indicates that the learner found it difficult to continue with the interaction as it was expected. This sense of rushed discussion is evident later on, as the learner decides to move on to the next prompt, stopping the interaction altogether. This is not evident in Replika – the same prompt produced the following sequence:

- What did you use to do that you don't do anymore?
- I used to go to the movies and dance on the couch
- And you don;t go to the movies now?
- I used to go to a movie because I was bored. Now I pretty much avoid it.
- Why do you avoid it?

- I don't know. I just have a bad feeling about it.
- Why do you have a bad feeling?
- I'm scared of what people will think of me if I'm honest.

In this case, the learner attempts to find out more about the chatbot's refusal of going to the theatre. In Replika, despite the existence of minor slips (possibly due to the quick typing), the conversation is not obstructed.

Moving on, the initial impression following the completion of the piloting stage was quite positive. A small number of issues was reported with the group of learners, and the chatbots seemed to function as intended, providing opportunities for consideration regarding the existence of fossilised patterns or cases of self-correction, which is expected at the learners' more advanced level. However, the period of working with this form of technology also revealed some potential shortcomings, which have encouraged a change in the planning of the final study.

Table 3.5 Problems and solutions during the pilot stage

Problems	Suggestions
The amount of interaction with the chatbots seems too much. Thirty minutes might result in idle talk, without any significance to the study.	The total amount of interaction was decreased to a total of twenty minutes. Participants can interact with the chatbots only if the requested conversation prompts trigger enough conversation to justify the additional time.
The size of the transcripts is not big enough for the requested amount of thirty minutes that was originally requested.	During the trial, the participants were asked to do the chatbot interaction as part of their homework. To ensure that the participants do spend the requested amount of time, the

	<p>chatbot interaction is now being planned to be part of the second weekly session, so that they can be observed working with the chatbots as much as Teams technology can allow.</p>
<p>The nature of some mistakes is unclear. The distinction between ‘slips’ and ‘fossilised patterns’ is not always clear.</p>	<p>The decision to move the chatbot interactions in the second live session attempts to deal with this problem. While under time pressure, some errors can be more easily attributed to typing slips. In addition, the data that will be collected might be more accurate, in the sense that the errors made by the participants will feel more natural and will not be a product of prior thinking, which could compromise the accuracy of the data.</p>

Of course, these are mere statements and conclusions coming from a very small group of participants. The data that will be generated from the actual participants is expected to be different and might shed a new light in the investigated areas, such as by addressing new types of errors that have not been originally considered.

3.4 The main study.

3.4.1 Overview of the main study

The successful completion of the pilot has provided the overview of the main study. The main study ran for thirteen weeks per group, or twenty-six sessions – whichever is first. One group of

participants has agreed in having two sessions per week, for a total of thirteen weeks. However, a more recent group of participants has decided it would be efficient if they could have more than two sessions per week, as they were more than happy to work during weekends. So, while the first group of participants spread their participation of the study over a period of thirteen weeks, the second group spent eleven weeks in total. Two sessions took place during a weekend, so that they would be able to finish before the Easter break.

The tools that were used during the main study were the following:

- a) **Microsoft Teams** for the delivery of the sessions. The chat function enforced the in-session communication of the participants and me. Breakout rooms were used in specific situations, though this was not a common occurrence. Most of the times the participants were using the main room for participation and interaction.
- b) **Google Classroom** as the online space for uploading the homework tasks. No additional homework space was created for the second group. Instead, the already uploaded tasks were heavily edited. This included the change of the order of the right answers and the wording of the questions. The rationale behind this was to give those of the participants who would happen to know anyone from the previous group of participants the impression that they were actually doing a new set of tasks.
- c) **AI chatbots**. Kuki and Replika were used by both groups. However, most of the participants decided to create an account and work with Replika.

The work that has been carried out during the trial of the study has changed the structure and improved the overall delivery. Some features remained the same, but lots of changes have been made, in order to ensure the optimum performance of the participants and to maintain a higher rate of participation. The following schematic shows the similarities and the differences between a lesson during the trial period, and the main study:

Table 3.6: Differences between trial and main sessions

A typical trial lesson	A typical main study lesson
<p>a) Quick revision of the previous grammar phenomenon, using questions in Kahoot.</p> <p>b) Presentation of the phenomenon using a PowerPoint presentation. This included the theoretical aspects of the phenomenon, along with examples to demonstrate it.</p> <p>c) Practice tasks.</p> <p>d) Quick multiple-choice quiz to consolidate the understanding of the phenomenon, using Kahoot.</p> <p>e) Assigning homework and discussion task for the selected AI chatbot.</p>	<p>a) Quick multiple-choice quiz to check previous knowledge of the phenomenon that will be introduced.</p> <p>b) Presentation of the phenomenon using a PowerPoint presentation. This included the theoretical aspects of the phenomenon, along with examples to demonstrate it.</p> <p>c) Practice tasks.</p> <p>d) Two short tasks to consolidate the understanding of the phenomenon. The questions were shared on the screen and the participants provided their own answers, while at the same time they were offered feedback from their peers and the tutor.</p> <p>e) Informing them about next week's homework.</p>

It is obvious that there are significant changes between the trial period and the main study sessions. It should be reminded that the purpose of the trial sessions was to check the technology, the flow of the session and the overall timings. All these aspects were taken into consideration while designing the main study sessions, which had to be spread into two weekly sessions, and not just one.

Each of the stages in a typical main study sessions had its own rationale. More specifically:

- Stage A multiple-choice quiz was there to check prior knowledge of the phenomenon with the learners. While the learners had a minimum level of C1, it was important to check whether they were really at this level. The quiz questions covered all aspects of the phenomenon according to the materials and notes that were employed for the lesson design, from the easier and more well-known to the more challenging ones. Any mistakes made here would lead to a more detailed discussion during the presentation stage. A maximum of ten minutes would be spent on this stage.
- Stage B did not present any specific changes compared to the trial sessions, except for the fact that the number of the presentations designed increased from five to thirteen. The presentations were created using information and materials from two different grammar books to ensure that a wide range of examples and related information could be delivered to the participants. Typically, Stage B would last for approximately twenty to twenty-five minutes, though a couple of sessions reached a maximum of thirty minutes.
- Stage C also followed the same patterns as in the trial sessions. Within forty minutes, the participants were exposed to a variety of tasks to complete. Some of the tasks included multiple-choice questions, some others were more open-cloze in nature, some required the participants to fill in the gaps with the missing words or phrases, while some others included responses that were more open-ended, thus providing more than one correct answer. The participants in this stage were asked to complete the tasks on their own, or they were assigned in pairs/small groups, especially with those that required a more careful approach. Feedback was provided as soon as they were done with each task, and questions were also answered.
- Stage D was employed to ensure the understanding of the phenomenon the participants were exposed to. Stage D typically included five multiple-choice questions and five open-cloze questions, with their difficulty range being from normal to a bit trickier. The

questions would be shared on the screen and the participants would be able to access them directly. Responses were usually immediate, as was feedback. A maximum of ten minutes would be required for this stage.

- Stage E would be the final thing to talk about before the end of the session. This is where participants were informed that their homework would be uploaded in Google classroom immediately after the end of the session. They were allowed a maximum of two working days to send their answers via email.

A look at 4.2 provides an accurate overview of the weekly sessions and their area of focus. The Appendix section includes additional information, such as a typical lesson plan, along with the contents of the presentation, the in-class tasks, the homework tasks and the chatbot task for further reference.

3.4.2 The second weekly session

The second weekly session played an equally important role for the conduct of the study. While the second study originally proved to be an additional incentive for the participants to remain in the study, since they were promised to practice useful vocabulary and expressions, its role in the study became more significant with the addition of the AI application exercise.

The decision to introduce the AI application exercise as part of the second weekly session was taken during the trial. Some concerns were raised regarding the effectiveness of the language used. In order to effectively measure whether fossilised language is still present, even after the teaching sessions, it was deemed necessary for the participants to complete the task in a controlled environment, and within specific time limitations. As a result, the participants would produce more accurate language, since they were interacting with the application spontaneously; had they done the tasks as part of their homework, the possibility of more samples of

corrected/edited language would have been higher.

The second weekly session would last for 90 minutes. The first hour would include the introduction of vocabulary and some practice tasks based on it. This first part of the session was irrelevant to the data collection stage; as it was mentioned above, this session was provided as an incentive. The remaining 30 minutes would be dedicated for the AI discussion chat. The topic of the discussion was provided prior to the session, on Google classroom, and the participants had the rest of the time to chat with the AI and send their transcripts on email, or directly through Teams.

The following table focuses on the AI task and how it was implemented after its original conception stage:

Table 3.6 Implementation stages of the AI chatbot task

Conception Stage	Trial	Main Study
Plans before the trial stage. Initially, the AI interaction was planned to be part of the first weekly session, which would last for 120 minutes. This concept was dropped before the trial, as two hours would be too much, even for Greek learners.	The AI interaction task was implemented as homework. The emphasis on this stage was to check whether the participants would be able to perform the task easily. Again, this was deemed to provide inaccurate results.	The AI interaction task moved to the second weekly session. This is not connected to all the vocabulary-related content, and the fact that there has been some time after the input allows more accurate results, in a limited

The following interaction, copied and adapted from Replika, is an example of what was

happening during the second weekly session. After the vocabulary tasks would take place, the students would engage in an AI task that was designed to use grammar introduced during the first weekly session.

- Hi, Stella! So, for today's task, we have a what-if scenario to discuss. What if Gollum managed to get the Ring from Frodo and escaped from Mt. Doom?
- Hi (Participant 22)! That sounds like an interesting scenario. What do you think would have happened if Gollum had escaped with the Ring?
- If Gollum would escape with the Ring, he'll become very powerful, I think, Stella.
- Interesting thought (Participant 22)! What else do you think might have happened?
- If Gollum would escape, he would take the Ring back to his cave.
- Okay (Participant 22), what do you think Sauron would do in this situation?
- Well, Stella, if he took the Ring back to his cave, he could stay hidden for a long time.
- Exactly (Participant 22)! What do you think Sauron would do if he knew Gollum had the Ring?
- If Sauron knew Gollum had the Ring, he'll try to find him immediately.
- **Interesting thought (Participant 22)! So, if Sauron knew Gollum had the Ring, he would try to find him immediately.**
- Yes! If Sauron found out, he would send his forces to capture Gollum.
- Perfect (Participant 22)! How do you think the rest of the Fellowship would react?
- If the Fellowship knew Gollum escaped with the Ring, they would have

gone after him to retrieve it.

- Yes, (Participant 22), it is possible. Any other thoughts on what might happen in this scenario?
- If they caught Gollum, they would destroy the Ring in Mt. Doom.
- Great job! This was a fun discussion. Do you have any other what-if scenarios you'd like to explore, (Participant 22)? I love talking about movies and their alternative possibilities!
- Not right now, Stella, but thanks for the help! We will talk again next time!
- Yes! I will be waiting for you (Participant 22)!

3.5 Data analysis tools

With the collection of all the scripts, the analysis of the mistakes would take place. The collected data was subsequently encoded and analysed using the Statistical Package for the Social Sciences (SPSS). This analytical tool provided a comprehensive set of statistical figures for each session which, in turn, delivered valuable insights into the participants' language performance before and after their interactions with the AI chatbot.

The descriptive statistics generated by SPSS showcase important pieces of information, such as the mean and standard deviation of the percentages of correct language usage observed in each session. These figures enable a quantitative understanding of the participants' language proficiency and error patterns, thereby facilitating a comprehensive assessment of their language learning progress.

An essential component of the statistical analysis involves conducting paired samples t-tests for the AI chatbot task. The paired samples t-tests helped compare the mean scores of the

proportion of correct uses of the target item in the AI chatbot before the AI chatbot corrected the error through a recast with the proportion of correct uses of the target item after the AI chatbot correction. The proportion of correct uses was calculated by dividing the number of correct uses of the target item by the number of total attempts at the target item. For example, five correct uses out of ten total attempts would result in a Correct Percentage Pre score of .5 or 50%.

Through the paired samples t-test, the analysis detects cases where statistical significance is observed, indicating a meaningful impact of the AI chatbot intervention on error correction and language proficiency improvement. Moreover, instances where statistical significance does not occur are also considered, with a concerted effort to offer plausible explanations for this phenomenon.

With the successful completion of the quantitative data analysis, another robust tool for the qualitative data analysis was employed—NVivo. Utilising NVivo proved to be of great importance in coding the participants' responses. This advanced software assisted in categorising the responses into relevant codes, which were linked to specific research questions. This coding process enabled the generation of frequency rates, which proved to be key features in interpreting elements of the participants' responses, ensuring that the interpretation remained aligned with the research questions.

NVivo's capabilities extended beyond mere categorisation of the participants' responses; it provided useful insights into the participants' perspectives, particularly concerning the use of technology and artificial intelligence. By carefully analysing these qualitative responses, we meaningful connections to the quantitative data obtained from the questionnaires were drawn. This integrative approach not only enriched our understanding of the participants' viewpoints but also highlighted nuanced connections between their attitudes towards AI and their responses to

the survey questions. Thus, NVivo played a crucial role in deepening our comprehension of the data, facilitating a comprehensive analysis that was both systematic and insightful.

3.6 Ethical Considerations

This research was carried out in accordance with the university's revised ethical guidelines for academic research (2021). Throughout the study, the need to deal with ethics-related issues was raised, and measures were taken to ensure that the study complies with the guidelines of the university's research approval committee.

Firstly, as far as "confidentiality" (Mc Donough and Mc Donough, 1997) is concerned, all of the participants in the teaching sessions are reassured that their observation data shall remain confidential, and that no personal information will be used out of the research context. As confidentiality and anonymity of the participants are one of the most important aspects for this project to be granted ethics approval, this has been extended to various aspects of the project. Specifically:

- a) No personal data would be used in various stages of the data analysis. Participants' names would be coded, where applicable, and only qualitative/quantitative data that is not associated to the participant's privacy would be presented.
- b) The information that comes from the chatbot transcripts and is presented in this work does not include any information that would allow a potential reader to identify a participant.
- c) Any participant-related material that appears in the Appendix section of this work does not reveal any personal information. In the case of interview transcripts, all the information is, once again, coded.

In addition, all the data that is, was or will be collected throughout the study, will be securely stored in OneDrive, Microsoft's cloud service, for a period of seven years, before it is destroyed – something that is made abundantly clear to the participants in the information sheet.

The research does not intend to cause harm to the participants, either corporeal or mental. Effort was made to keep the online learning environment dynamics and routines to a minimum level. Additional effort was made to simulate the experience of a real-life classroom, where the participants will actively contribute and participate, without feeling that their actions are being measured, and that their responses are being constantly recorded and evaluated. This information reflects on the lesson plans for the sessions, which include only the necessary amount of in-class work and homework, and enough time to reflect on discussions about the topics presented and taught that would encourage engagement and make the sessions as enjoyable as possible.

3.7 Limitations of the Methodology

Even though all the data collection tools were planned to the smallest detail, to ensure the validity and reliability of the acquired data, there were some factors that could have changed the outcome of this study, if this study were to be carried out under normal conditions. Some are of minor importance, while some others are of greater significance and effort will be made to discuss them below.

Ideally, for reliability issues and to ensure the right behaviour and the correct amount of participation of the learners, the teaching sessions should have taken place in a physical learning space. Since the study was never associated with a university, a school or a language centre, that physical space would not necessarily be a classroom in the traditional sense, but a space equipped with seating spaces and desks. The delivery of the physical sessions would have been a blend of physical and electronic delivery, in which learners would have brought their own

devices to receive learning content and participate. Unfortunately, the COVID-19 pandemic drastically changed all the original plans. With potential participants feeling unwell to be physically present in a physical space, and with others preferably wanting to be in an environment with no physical restrictions, such as the use of face coverings, the use of an online learning environment was the only available way for the data collection stage. This caused a change in the original data collection tools, which required observations as a form of an indirect understanding of the learners' personal attitudes towards making mistakes. Since observations are limited, due to the distant learning process that took place, any understanding of the learners' attitudes towards the effectiveness of technology and their attitudes towards mistakes will be observed through the use of interviews and questionnaires.

Originally, the study was to be undertaken at a Greek EAP context, and data was to be collected from actual EAP students. The pandemic, combined with the fact that ministry regulations would only permit the researcher to be physically available for data collection for only **one week**, also led to a change of plans regarding physical teaching, as well as a complete change of a target group. Ultimately, data collection will be taken from both university students and employed adults, using the proposed online learning environment and tools, while any additional information can be acquired using questionnaires/interviews.

Triangulation of the data originally considered an additional form of data collection, namely the interviews. However, there are many factors that could have contributed to the difficulty of doing interviews. For example, difficulties in the availability of the learners and the time of the year that interviews might be required to take place (i.e., around Christmas holidays) could make it difficult for them to be interviewed via online software (Teams), telephone, or even face-to-face. This has proven to be a severe issue, especially since interviews have eventually been proven to be necessary for additional validation of the data that has been

obtained during the main study and the questionnaire responses. As a result of this, interviews had to be conducted during a later stage in the study, despite a one-year gap existing between the end of the main study/questionnaires and the time they took place. It is for this reason that an additional research method had to be considered, in order to help the interviewees bridge that gap, and remember the finer details of the study they participated in: Stimulated Recall.

Chapter 4: Findings of the study

4.1 Introduction

Having introduced the methodological aspects of the study, the next step is to proceed with the presentation of the findings that have emerged from the collected data. Both qualitative and quantitative data has been collected during the teaching sessions, including results and statistics from the given homework and the AI chatbot tasks, as well as opinions and points that reflect through the responses of the participants in the questionnaires and the interviews.

Therefore, this chapter will present all the quantitative and the qualitative data findings, as they have occurred through a process of editing and analysis. The chapter will start with the presentation of the quantitative data, in the form of statistics, which can provide some insight regarding the level of improvement throughout the study. The qualitative data follows next and will attempt to present the opinions of the participants as they reflect on various points that are connected to the research questions of the study.

The table below provides a general overview of the research questions and what types of data are used to address them:

Table 4.1 Research questions, types and rationale for the collected data.

Types of the collected data	Research Question each aspect relates	Rationale
	RQ1: What are the written grammatical errors advanced adult Greek learners of English	

<p><i>Responses collected from the completion of questionnaires</i></p>	<p>produce?</p> <p>RQ2: What is the learners' perception regarding producing and correcting written grammatical errors of English??</p> <p>RQ3: Why is it important for adult Greek learners to study English and reach a high standard level?</p> <p>RQ4: How effective is the application of computer-assisted and mobile-assisted language learning, including AI apps in correcting advanced adult Greek learners' grammar and lexis errors?</p>	<p>Questionnaires were able to incorporate all the elements of the study that needed to be incorporated in the study. They were completed at the end of the study, giving the participants the chance to provide more accurate responses.</p>
	<p>RQ1: What are the written grammatical errors advanced adult Greek</p>	

<p><i>Points of view gathered through the responses provided in the interviews.</i></p>	<p>learners of English produce?</p> <p>RQ2: What is the learners' perception regarding producing and correcting written grammatical errors of English??</p> <p>RQ3: Why is it important for adult Greek learners to study English and reach a high standard level?</p> <p>RQ4: How effective is the application of computer-assisted and mobile-assisted language learning, including AI apps in correcting advanced adult Greek learners' grammar and lexis errors?</p>	<p>Used for triangulation purposes, interviews took place months after the end of the teaching sessions. The interviewees were able to reflect on their responses, often providing a fresh and newer perspective on their responses.</p>
<p><i>Percentage of correct language uses in the AI</i></p>	<p>RQ4: How effective is the application of computer-</p>	<p>Once more, comparing</p>

<p><i>chatbot task before the moment the chatbot identified a mistake and intervened.</i></p>	<p>assisted and mobile-assisted language learning, including AI apps in correcting advanced adult Greek learners' grammar and lexis errors?</p>	<p>and contrasting the percentages of correct language use before and after the moment the AI intervened has shown the overall effectiveness of the tool. The hypothesis</p>
<p><i>Percentage of correct language uses in the AI chatbot after the moment the chatbot identified a mistake and intervened.</i></p>	<p>RQ4: How effective is the application of computer-assisted and mobile-assisted language learning, including AI apps in correcting advanced adult Greek learners' grammar and lexis errors?</p>	<p>that became the foundations of this study suggested that there would be no mistakes after the AI intervention, resulting in a more accurate language use.</p>

It is important to emphasise that the tables presenting the statistical results reflect the collective outcomes for the entire cohort of participants, rather than being segmented by individual groups. Despite the participants being divided into two groups, the mechanics of the study and the tasks assigned to them were standardised, albeit with minor variations in wording. This approach ensures uniformity and consistency in the data analysis and interpretation, enabling a holistic assessment of the participants' language learning experiences and the effectiveness of the AI chatbot intervention.

The quantitative data that follows next will be presented by each session that was introduced to the participants. Since each session focuses on a separate grammatical phenomenon, it would be helpful to the readers of this thesis to compare the progress that has been made in different phenomena and get a better understanding of the areas of grammar that have proven to be challenging to the participants. As a quick reminder, the following table will present a quick outline of the sessions, and the areas of grammar they focused on.

Table 4.2 Overview of sessions and their corresponding findings

Session	N	Mean scores pre	Mean scores post	SD pre	SD post	SE pre	SE post
Present and Future Tenses	34	0.600	0.947	0.276	0.111	0.047	0.019
Past Tenses, Used/Would	34	0.696	0.954	0.226	0.089	0.039	0.015
Conditionals	34	0.623	0.919	0.244	0.167	0.042	0.029
Wish/Unreal Past	34	0.574	0.941	0.372	0.205	0.064	0.035
Passive Voice/Causative Form	34	0.686	0.996	0.253	0.024	0.043	0.004
Reported Speech/Subjunctive	34	0.642	0.987	0.233	0.043	0.040	0.007
Modal Verbs	34	0.926	0.990	0.185	0.041	0.032	0.007
Word Order/Inversion	34	0.784	0.994	0.248	0.034	0.043	0.006
Gerunds/Infinitives	34	0.936	0.995	0.179	0.029	0.031	0.005

Articles	34	0.804	0.993	0.244	0.043	0.042	0.007
Prepositions	34	0.931	0.996	0.170	0.021	0.029	0.004
Phrasal Verbs	34	0.968	0.993	0.089	0.030	0.015	0.005

It should also be noted that quantitative data collection has taken place up to Session 12. Session 13, being the final session of each of the two teaching periods, was only dedicated to in-class practice. No homework was assigned, and thus no data samples were collected for evaluation and analysis.

4.1.1 Session 1 – Present and Future Tenses

The descriptive statistics in Table 4.3 for Session 1 show the performance of the participants on a session for the Present Tenses.

It would be expected that advanced Greek learners of English would not benefit greatly from the use of AI while working on a session that involves the practice in Present tenses. This reflects on the results provided in their homework, which reveal a generally high performance in this session. In this case, it would be extremely interesting to check the effectiveness of the AI chatbot as a correction tool, according to the information appearing in the following table:

Table 4.3: Session 1 Paired Samples T-Test

Measure 1	Measure 2	t	df	p
S1 Correct percentage pre	S1 Correct percentage Post	-7.442	33	< .001

Note. Student's t-test.

Descriptives

	N	Mean	SD	SE	Coefficient of variation
S1 Correct percentage pre	34	0.600	0.276	0.047	0.460
S1 Correct percentage Post	34	0.947	0.111	0.019	0.117

The analysis conducted for Session 1 using a paired samples t-test revealed noteworthy findings regarding the participants' accuracy of language use before and after the intervention. Prior to the intervention, the mean score of the correct percentage was 0.600, with a standard deviation of 0.276. Following the intervention, the mean score of the correct percentage increased to 0.947, accompanied by a reduced standard deviation of 0.111. These results were further supported by the coefficient of variation, which decreased from 0.460 before the intervention to 0.117 after the intervention, indicating greater precision and reduced dispersion of the data around the mean.

The paired samples t-test demonstrated a statistically significant difference between the two means, with a p-value of less than 0.001. This outcome signifies that the intervention had a substantial positive effect on the participants' accuracy of language use, leading to a notable increase in the mean correct percentage from 0.600 to 0.947.

The data analysis for Session 1 suggests that the intervention successfully enhanced the participants' language accuracy, particularly concerning the use of present tenses. The intervention effectively contributed to their improved proficiency, enabling them to employ more accurate language structures within the context of present tenses.

4.1.2 Session 2 – Past Tenses, Used/Would

This is a session that proved challenging, even for advanced learners, though the statistics show that the participants of the study benefitted from the use of the AI as a correction tool.

Therefore, Table 4.4 shows whether there is statistical significance in using the AI chatbot as an improvement tool for a challenging session like this.

Table 4.4: Session 2 Paired Samples T-Test

Measure 1	Measure 2	t	df	p
S2 Correct percentage pre	- S2 Correct percentage post	-6.916	33	< .001

Note. Student's t-test.

Descriptives

	N	Mean	SD	SE	Coefficient of variation
S2 Correct percentage pre	34	0.696	0.226	0.039	0.324
S2 Correct percentage post	34	0.954	0.089	0.015	0.093

The statistical analysis for Session 2 involved a paired samples t-test, comparing the mean scores of correct language percentages before and after the intervention. Prior to the intervention, the mean score of correct language was 0.696, with a standard deviation of 0.226. Following the intervention, the mean score of correct language increased to 0.954, accompanied by a reduced standard deviation of 0.089. Moreover, the coefficient of variation decreased from 0.324 before the intervention to 0.093 after the intervention, indicating that the data became more tightly clustered around the mean, thereby demonstrating greater precision.

The paired samples t-test indicated a statistically significant difference between the two

mean scores, with a p-value of less than 0.001. This outcome establishes that the intervention had a notable positive impact on the participants' accuracy of language use, leading to a significant increase in the mean correct percentage from 0.696 to 0.954.

Overall, the data from Session 2 unequivocally demonstrates that the intervention effectively improved the participants' language accuracy. The AI chatbot's role in fostering language proficiency was particularly noteworthy in the context of the advanced participants, even in a session that presented a higher level of linguistic complexity.

The results from Session 2 reaffirm the success of the intervention in promoting greater language accuracy and proficiency among the participants. The intervention's positive influence was evident across participants of different language proficiency levels, indicating its capacity to facilitate language improvement even for those with higher prior knowledge and skills.

4.1.3 Session 3 – Conditionals

According to existing literature (Papaefthymiou-Lytra, 2001) the three conditionals, the grammatical phenomenon that this session focuses on is apparently a challenging one for Greek learners. While the first two conditionals do not prove to be particularly difficult, as they are phenomena that learners can map and associate in their first language, the third conditional form is the one that might actually pose a challenge to them. This is also the first session where the AI did not function as expected. Some participants were provided a correct structure quite early in the task, whereas other participants were notified much later in the task.

Regarding the effectiveness of the AI as a tool that can help with the correct use of language, the following table can provide some clear responses as well:

Table 4.5: Session 3 Paired Samples T-Test

Measure 1	Measure 2	t	df	p
S3 Correct percentage pre	- S3 Correct percentage post	-6.954	33	< .001

Note. Student's t-test.

Descriptives

	N	Mean	SD	SE	Coefficient of variation
S3 Correct percentage pre	34	0.623	0.244	0.042	0.391
S3 Correct percentage post	34	0.919	0.167	0.029	0.181

The results from the third session in the study reaffirm the AI chatbot's efficacy in facilitating overall improvement in the participants' language accuracy. A paired t-test, conducted on the data representing correct language usage before and after the intervention of the AI chatbot, yielded a p-value of less than 0.005. This statistically significant result supports the rejection of the null hypothesis and provides evidence that the AI chatbot had a positive impact on the performance of the advanced participants.

Interestingly, this session presented a unique case of grammar, one characterised by varying levels of performance and difficulty. Despite these variations, the AI chatbot demonstrated its efficiency in enhancing language proficiency across the participants. The intervention's effectiveness was particularly notable among the advanced learners, even in the context of a grammar topic that presented challenges of different degrees for each participant. The data from the third session underscores the robustness of the AI chatbot's ability to address individual learning needs and support learners in areas of grammar that may pose different levels of difficulty. The statistically significant results obtained through the paired t-test provide compelling evidence of the AI chatbot's positive impact on the participants' language accuracy, particularly in this session that involved a distinctive grammar focus.

The findings from the third session seem to reinforce the AI chatbot's effectiveness as a valuable tool for language learning improvement. Its capacity to adapt to the diverse needs and performance levels of the participants, particularly in a session involving varied grammar challenges, highlights its potential to enhance language proficiency across different learner profiles. These results further contribute to the growing body of evidence supporting the efficacy of AI-based interventions in language learning and error correction.

4.1.4 Session 4 – Wish / Unreal Past

Session 4 focused on the practice of the verb “wish” and the Unreal Past. While the two structures of the verb “wish” do not seem to cause enough difficulty on more advanced learners of English, the Unreal Past as a phenomenon could prove to be more challenging. Despite this, the participants in the study performed generally well on the AI task of this session.

Overall, the information of the descriptive statistics for Session 4 is rather positive and encouraging. The results suggest that the participants have managed to decrease the number of mistakes they make, while they have also succeeded in maintaining a high level of performance in regard to the instances of the correct language use throughout their work. This is also an encouraging sign that the AI has worked as planned. To discard any doubts of whether the AI technology has been able to assist the participants in this session can be answered through the following table:

Table 4.6: Session 4 Paired Samples T-Test

Measure 1	Measure 2	t	df	p
S4 Correct percentage pre	S4 Correct percentage post	-5.708	33	< .001

Table 4.6: Session 4 Paired Samples T-Test

Measure 1	Measure 2	t	df	p	
<i>Note.</i> Student's t-test.					
Descriptives					
	N	Mean	SD	SE	Coefficient of variation
S4 Correct percentage pre	34	0.574	0.372	0.064	0.649
S4 Correct percentage post	34	0.941	0.205	0.035	0.217

The outcomes of the fourth session showcase the remarkable effectiveness of AI technology in assisting the participants, even when they initially demonstrate satisfactory performance. The AI chatbot intervention consistently contributes to reducing the number of mistakes made by learners and enhances the accuracy of their language use.

The results from the paired sample t-test indicate a statistically significant difference between the mean scores of correct language use percentages before and after the AI intervention. The t-value of -5.708 and the p-value of less than 0.001 underscore the substantial impact of the intervention on the participants' correct language usage in the AI task. Prior to the AI intervention, the mean score of correct language use percentage was 0.574, with a standard deviation of 0.372. Following the intervention, the mean score significantly increased to 0.941, accompanied by a reduced standard deviation of 0.205. This difference in mean values signifies a reduction in mistakes after the AI intervention, leading to a greater frequency of correct language usage.

The coefficient of variation (CV), representing the ratio of the standard deviation to the mean expressed as a percentage, provides insights into the precision of the data. In this case, the lower CV of 0.217 for the second group (after the AI intervention) indicates that the data is more tightly clustered around the mean, reflecting increased precision and accuracy in the participants' language performance.

Overall, the findings derived from the paired sample t-test and the descriptive statistics unequivocally support the positive impact of the AI intervention on the participants' performance in the AI task. The results indicate a significant reduction in mistakes and an enhancement in the participants' language accuracy, even in a session where initial performance levels appeared satisfactory. The increased precision in the data further substantiates the efficacy of the AI chatbot in facilitating error reduction and promoting more accurate language use. These findings reinforce the vital role of AI technology in language learning support and error correction, contributing to a more comprehensive understanding of its potential benefits for language learners.

4.1.5 Session 5 – Passive Voice / Causative form

Session 5 focuses on the Passive Voice and the Causative form, two phenomena that have also been characterised as particularly challenging for the Greek learners of English. While, however, this might seem like a challenge to less advanced Greek learners, the two phenomena did not prove to be too demanding to the advanced learners of the study.

Overall, the descriptive statistics suggest a positive impact of the AI intervention on the performance of the participants in both reducing the number of mistakes made and improving the correct uses of language in the task. As far as the relevance of the AI chatbots in regards with the improvement of mistakes, the following table can be quite encouraging:

Table 4.7: Paired Samples T-Test

Measure 1	Measure 2	t	df	p
S5 Correct percentage pre	S5 Correct percentage post	-7.281	33	< .001

Note. Student's t-test.

Descriptives

	N	Mean	SD	SE	Coefficient of variation
S5 Correct percentage pre	34	0.686	0.253	0.043	0.368
S5 Correct percentage post	34	0.996	0.024	0.004	0.024

The data presented in the table represents the findings from a paired-samples t-test, which was employed to compare the means of the percentage of correct language uses in the AI task before and after the AI intervention. The t-test is a statistical method used to assess whether there is a significant difference between the two means, with an associated p-value determining the level of statistical significance.

The analysis revealed that before the AI intervention, the mean percentage of correct language uses was 0.686, with a standard deviation of 0.253. Following the AI intervention, the mean percentage increased to 0.996, accompanied by a reduced standard deviation of 0.024. The t-value obtained from the test was -7.281, and the corresponding p-value was reported to be less than 0.001. Given that the p-value is less than the typical threshold of 0.05 used for statistical significance, strong evidence exists to reject the null hypothesis. The null hypothesis suggests that using the AI as a correction and improvement tool makes no difference to the participants. However, the results lead to the acceptance of the original hypothesis, indicating that there is a significant difference in language usage when the AI tool is utilised.

Based on the outcomes of the t-test, it can be concluded that a statistically significant difference exists between the percentage of correct language uses in the AI task before and after the AI intervention. This implies that the AI intervention had a positive and beneficial impact on the participants' language proficiency, enhancing their ability to use language correctly in the task. The findings strongly support the effectiveness of the AI chatbot as a valuable tool for improving language accuracy and proficiency. The results underscore the potential benefits of AI-based interventions in language learning and error correction, providing important implications for language educators and learners alike.

4.1.6 Session 6 – Reported Speech / Subjunctive

Session 6 was designed having another grammatical phenomenon that often proves challenging to Greek learners of English - the Reported Speech and the Subjunctive. The Reported Speech is a phenomenon that requires a good knowledge and understanding of the past tenses, whereas the Subjunctive, while a generally easier phenomenon, often causes confusion between the British English and the American English structures and is thus considered to be challenging for Greek learners.

Regarding the effectiveness of the AI chatbots as a correction tool, the collected data for Session 6 reveals the following pieces of information:

Table 4.8: Paired Samples T-Test

Measure 1	Measure 2	t	df	p
S6 Correct percentage pre	S6 Correct percentage post	-8.904	33	< .001

Note. Student's t-test.

Descriptives

	N	Mean	SD	SE	Coefficient of variation
S6 Correct percentage pre	34	0.642	0.233	0.040	0.363
S6 Correct percentage post	34	0.987	0.043	0.007	0.044

The data presented in the table indicates a significant improvement in participants' performance in the AI task after the intervention, as evidenced by a statistically significant t-value of -8.904 and a p-value of less than 0.001. This result demonstrates the effectiveness of the intervention in enhancing language accuracy and proficiency among the participants.

Before the AI intervention, the mean score for the correct language use percentage was 0.642, with a standard deviation of 0.233. Following the intervention, the mean score increased to 0.987, accompanied by a reduced standard deviation of 0.043. The standard error for the correct language use percentage before the AI intervention was 0.040, and after the AI intervention, it decreased to 0.007.

These findings are consistent with the patterns observed in earlier sessions of the study, demonstrating that the AI chatbot, as a correction tool, serves as a catalyst for reducing mistakes in participants' language usage. Even among advanced learners who can handle more challenging aspects of the language, the AI intervention proves to be instrumental in enhancing their language accuracy and performance.

The statistically significant improvement in the post-test compared to the pre-test, along with the consistent patterns observed across the study, reinforces the notion that AI-based interventions have a positive impact on language learning and error correction. The results

provide valuable insights for language educators and researchers, highlighting the potential benefits of integrating AI technology as a supportive tool in language learning environments.

Once again, the data showcases the effectiveness of the AI chatbot intervention in fostering language improvement, particularly in reducing mistakes and enhancing language accuracy among participants. This underscores the importance of leveraging AI technology as a valuable resource in language education, promoting more efficient and effective language learning outcomes for learners across various proficiency levels.

4.1.7 Session 7 – Modal Verbs

Session 7 focused on the introduction of certain modal verbs and their functions in a variety of functional contexts. Modal verbs are considered to be a challenging aspect for Greek learners of English according to existing literature, though this session with the two groups of advanced learners proved otherwise.

Regarding the effectiveness of the AI as a correction tool in this session, the following table can provide some additional information:

Table 4.9: Paired Samples T-Test

Measure 1	Measure 2	t	df	p
S7 Correct percentage pre	S7 Correct percentage post	-2.258	33	0.031

Note. Student's t-test.

Descriptives

	N	Mean	SD	SE	Coefficient of variation
S7 Correct percentage pre	34	0.926	0.185	0.032	0.199
S7 Correct percentage post	34	0.990	0.041	0.007	0.041

The paired samples t-test presented in the table was conducted to investigate differences in the correct percentage of language use before and after the AI intervention. The mean scores and standard deviations for the percentages of correct language use both before and after the AI intervention demonstrate the stability and relevance of the collected data.

The results indicate a significant decrease in the mean correct percentage before the AI intervention, with a mean score of 0.926 and a standard deviation of 0.185. After the AI intervention, there was a further decrease in the mean correct percentage, with a mean score of 0.990 and a standard deviation of 0.041. The t-value for the test was -2.258, and the p-value was reported as 0.031, which is less than the threshold of 0.05, rejecting the original null hypothesis. These findings suggest that the intervention possibly had an effect on the participants' language use.

The coefficient of variation for S7 Correct percentage pre (CV = 0.199) and S7 Correct percentage post (CV = 0.041) indicates moderate and low variability, respectively, in the data. This further supports the effectiveness of the AI intervention in reducing the number of mistakes made by the participants and enhancing language accuracy.

The results corroborate the value of the AI intervention in this study, as it demonstrated to be of great assistance to learners in reducing language errors. The AI's positive impact on participants' language use is evident in the significant decrease in the mean correct percentage after the intervention, as well as the reduced variability in the data. The findings from the paired

samples t-test and the coefficient of variation analysis reinforce the significant value of the AI chatbot intervention in promoting language accuracy and reducing mistakes among participants. The AI technology's ability to provide personalised and targeted error correction support contributes to improved language learning outcomes and underscores the potential benefits of integrating AI-based tools in language education.

4.1.8 Session 8 – Word Order / Inversion

Session 8 was focused on the word order and the inversion, phenomena that might prove to be challenging to a variety of Greek learners of English. However, this session did not prove to be difficult for the group of participants in the study.

Overall, the descriptive statistics suggest a positive impact of the AI intervention on the performance of the participants in both reducing the number of mistakes made and improving the correct uses of language in the task. As far as the relevance of the AI chatbots in regards with the improvement of mistakes, the following table can be quite encouraging:

Table 4.10: Paired Samples T-Test

Measure 1	Measure 2	t	df	p
S8 Correct percentage pre	S8 Correct percentage post	-5.025	33	< .001

Note. Student's t-test.

Descriptives

	N	Mean	SD	SE	Coefficient of variation
S8 Correct percentage pre	34	0.784	0.248	0.043	0.316

Descriptives

	N	Mean	SD	SE	Coefficient of variation
S8 Correct percentage post	34	0.994	0.034	0.006	0.035

The paired samples t-test reveals a statistically significant difference between the pre-intervention and post-intervention scores of correct language use percentages [$t(33) = -5.025$, $p < 0.001$, which is less than the significance level of 0.005, thus rejecting the original null hypothesis]. The mean pre-intervention score was 0.784, with a standard deviation of 0.248, and a coefficient of variation of 0.316. In contrast, the mean post-test score increased to 0.994, with a reduced standard deviation of 0.034 and a notably lower coefficient of variation of 0.035. These results demonstrate that the post-intervention scores were significantly higher than the pre-test scores, indicating a successful intervention that effectively increased the S8 Correct percentage. The substantial difference between the pre and post-test scores, coupled with the low coefficient of variation in the post-test scores, suggests that the intervention had a large and consistent impact on participants' language performance.

The statistically significant improvement in correct language use percentages, along with the reduced variability in the post-test scores, provides robust evidence of the AI chatbot's efficacy in enhancing language accuracy and proficiency for participants in Session 8. The intervention's successful outcome highlights its value as a potent tool for personalised error correction and language improvement.

To sum up, the findings from the paired samples t-test and the coefficient of variation analysis underscore the significant positive impact of the AI chatbot intervention in Session 8. The intervention's ability to consistently increase correct language use percentages and reduce the variability in participants' performance showcases its effectiveness in supporting language

learning and error correction.

4.1.9 Session 9 – Gerunds/ Infinitives

Session 9 focused on the practice of gerunds and infinitives. These two grammatical points can be challenging, according to the existing literature, but more advanced learners have been exposed to these phenomena for years and could be expected to perform better, which is the case with the participants of this study.

As for the effectiveness of the AI as a correction and improvement tool, the next table can provide some clear answers:

Table 4.11: Paired Samples T-Test

Measure 1	Measure 2	t	df	p
S9 Correct percentage pre	S9 correct percentage post	-2.098	33	0.044

Note. Student's t-test.

Descriptives

	N	Mean	SD	SE	Coefficient of variation
S9 Correct percentage pre	34	0.936	0.179	0.031	0.191
S9 correct percentage post	34	0.995	0.029	0.005	0.029

The paired samples t-test conducted on Session 9 data also demonstrates a statistically significant difference between the pre-intervention and post-intervention scores of correct language use percentages [$t(33) = -2.098$, $p = 0.044$, which is less than the significance level of 0.05, thus rejecting the original null hypothesis]. The mean pre-intervention score was 0.936, with a standard deviation of 0.179, and a coefficient of variation of 0.191. On the other hand, the

mean post-test score increased to 0.995, with a reduced standard deviation of 0.029 and an impressively low coefficient of variation of 0.029.

These findings once again confirm that the post-intervention scores were significantly higher than the pre-test scores, indicating the success of the intervention in increasing the correct percentage of language use in Session 9. The substantial difference between the pre and post-test scores, combined with the remarkably low coefficient of variation in the post-test scores, further supports the conclusion that the intervention had a significant and consistent impact on participants' performance.

Consistent with the results of previous sessions, the use of the AI chatbot as an effective tool is established, assisting learners of all proficiency levels in producing more accurate linguistic output. The statistically significant improvement in the correct language use percentages in Session 9 reaffirms the positive impact of the AI intervention, further supporting its value in language learning and error correction.

In conclusion, the results of the paired samples t-test and the coefficient of variation analysis provide robust evidence of the effectiveness of the AI chatbot intervention in Session 9. The intervention's ability to consistently enhance language accuracy and reduce errors reinforces its role as a valuable resource in language education, while the findings contribute to the holistic comprehension of the benefits of AI-based tools in supporting language learners in their learning journeys.

4.1.10 Session 10 - Articles

Session 10 was an interesting session that focused on the use of articles. Based on information from existing literature, the distinction between definite and indefinite articles can

prove to be somehow challenging to less advanced learners, though it would be interesting to see how more advanced learners would perform.

To validate the effectiveness of the AI chatbot as an overall improvement tool, it would be useful to look at the information on the following table:

Table 4.12: Paired Samples T-Test

Measure 1	Measure 2	t	df	p
S10 Correct percentage pre	S10 Correct percentage post	-4.714	33	< .001

Note. Student's t-test.

Descriptives

	N	Mean	SD	SE	Coefficient of variation
S10 Correct percentage pre	34	0.804	0.244	0.042	0.304
S10 Correct percentage post	34	0.993	0.043	0.007	0.043

The information presented in this table reaffirms the relevance and effectiveness of the AI chatbot as a valuable means to improve the quality of language production and reduce the occurrence of mistakes. As seen in previous sessions, the results of the paired samples t-test for Session 10 also demonstrate a statistically significant difference between the pre-intervention and post-intervention scores of correct language use percentages [$t(33) = -4.714, p < .001$, which is less than the significance level of 0.05, thus rejecting the original null hypothesis].

The mean pre-intervention score was 0.804, with a standard deviation of 0.244, and a coefficient of variation of 0.304. The mean post-test score increased to 0.993, with a reduced standard deviation of 0.043, and a coefficient of variation also at 0.043. These results indicate that the post-intervention scores were slightly higher than the pre-test scores, signifying the

success of the AI chatbot intervention in increasing the correct percentage of language use in Session 10.

The significant difference between the pre and post-test scores, coupled with the low coefficient of variation in the post-test scores, strongly suggests that the intervention had a significant and consistent impact on participants' language performance. The AI chatbot continues to demonstrate its effectiveness as an efficient tool, assisting learners of all proficiency levels in producing more accurate linguistic output.

Similarly to the previous sessions, the results of the paired samples t-test provide further evidence of the positive impact of the AI chatbot intervention in Session 10. The consistent improvement in the correct percentage of language use and the reduced variability in performance support the value of the AI-based tool in language education and error correction. The findings reinforce the notion that the AI chatbot can be an effective resource in language learning, catering to the needs of learners across various proficiency levels, ultimately enhancing language accuracy and proficiency.

4.1.11 Session 11 - Prepositions

Session 11 focused on the practice of prepositions, which can be used in a variety of contexts. While prepositions are indeed mentioned in the literature, they should not be a really challenging aspect for advanced learners of English, a fact that the participants of this study have successfully demonstrated.

Overall, the data suggests that the intervention had a positive effect on the participants themselves, along with the credibility of the AI as an improvement tool. Of course, it is important to look at the contents of the following table, regarding the significance of the data

and the overall consolidation of the AI chatbot as an improvement tool:

Table 4.13: Paired Samples T-Test

Measure 1	Measure 2	t	df	p
S11 Correct percentage pre	S11 Correct percentage post	-2.347	33	0.025

Note. Student's t-test.

Descriptives

	N	Mean	SD	SE	Coefficient of variation
S11 Correct percentage pre	34	0.931	0.170	0.029	0.182
S11 Correct percentage post	34	0.996	0.021	0.004	0.022

The trend observed in the previous sessions continues in Session 11, as the results of the paired samples t-test demonstrate a statistically significant difference between the pre-intervention and post-intervention scores of correct language use percentages [$t(33) = -2.347$, $p = 0.025$, which is less than the significance level of 0.05, thus rejecting the original null hypothesis]. The mean pre-intervention score was 0.931, with a standard deviation of 0.170, and a coefficient of variation of 0.182. The mean post-test score increased to 0.996, accompanied by a reduced standard deviation of 0.021 and an impressively low coefficient of variation of 0.022. These findings clearly indicate that the post-intervention scores are significantly higher than the pre-intervention scores, reaffirming the success of the AI chatbot intervention in increasing the correct percentage of language use in Session 11. The substantial difference between the pre and post-test scores, along with the remarkably low coefficient of variation in the post-test scores, strongly suggests that the intervention had a significant and consistent impact on participants' language performance.

Furthermore, the results emphasise the effectiveness of the AI chatbot in assisting even

advanced learners in producing a more accurate output of language, despite their previous instances of high performance. The AI intervention proves to be a valuable resource for learners at all levels, facilitating personalised error correction and language improvement. There is no space for doubt that these findings contribute to the growing body of evidence supporting the efficacy of AI-based tools in language learning and error correction, further highlighting their potential benefits in fostering language proficiency development.

4.1.12 Session 12 – Phrasal Verbs

For the final AI chatbot session in the study, the phrasal verbs were selected as an area of focus. Phrasal verbs are not a pure grammatical phenomenon, yet they might pose a challenge to learners due to their nature and, in some cases, their multiple meanings. The AI chatbot session has followed a teaching session and a homework practice task with a selection of phrasal verbs, and the AI chatbot task was a session that was more open in nature; therefore, more correct instances of language was expected from the beginning, a fact that can be observed statistically as well.

On a first glance, the data suggests that the intervention had a significant impact on the participants' performance, reducing the number of mistakes made while increasing the variability in the number of correct uses of language. However, by considering the nature of the task and the expected high performance of the participants, it is important to consider the statistical significance coming from a paired t-test that can verify the validity of the AI chatbot as an improvement tool.

Table 4.14: Paired Samples T-Test

Measure 1	Measure 2	t	df p
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Table 4.14: Paired Samples T-Test

Measure 1	Measure 2	t	df	p
S12 correct percentage pre	S12 Correct percentage post	-1.915	33	0.064

Note. Student's t-test.

Descriptives

	N	Mean	SD	SE	Coefficient of variation
S12 correct percentage pre	34	0.968	0.089	0.015	0.092
S12 Correct percentage post	34	0.993	0.030	0.005	0.030

The table for the final session displays the results of a paired samples t-test conducted to compare the performance of an AI system before and after the intervention.

The t-test results indicate a statistically significant difference between the two measures, with a t-value of -1.915 and a p-value of 0.064. Notably, the p-value of 0.064 is greater than the significance level of 0.05, indicating that there is not enough evidence to reject the original null hypothesis. In other words, the results suggest that the difference in performance between the pre-intervention and post-intervention measures may not be statistically significant.

The table also provides descriptive statistics for the two measures. The mean pre-intervention score was 0.968, with a standard deviation of 0.089 and a coefficient of variation of 0.092. On the other hand, the mean post-intervention score was 0.993, with a standard deviation of 0.030 and a coefficient of variation of 0.030. These results indicate that the post-intervention scores are slightly higher than the pre-intervention scores, suggesting a positive impact of the AI chatbot intervention in increasing the correct percentage of language use in Session 11.

Overall, the results of the t-test suggest a potential trend of improvement in the correct percentage of language use, with the post-intervention measure displaying a higher mean score compared to the pre-intervention measure. However, it is important to note that the difference is not significant enough to reject the null hypothesis. The descriptive statistics further reveal that the post-intervention measure had a higher mean, less standard deviation, and less relative variability, which may be relevant to the selected topic for this session. It indicates that the application of AI tools in future learning contexts might benefit from avoiding phrasal verbs as a topic of practice to potentially enhance language accuracy and reduce variability in learners' performance.

In conclusion, while the results suggest a positive impact of the AI chatbot intervention in Session 12, the lack of statistical significance in the t-test indicates that further investigation and exploration are required to draw definitive conclusions. Despite this, however, descriptive statistics for the quantitative data collected throughout all sessions seem promising towards the effectiveness of the AI chatbots as a correction and feedback providing tool. The tools that were used helped the participants to notice their errors and attempt to correct them. The next thing that needs to be investigated is the opinions of the participants themselves regarding a variety of questions that aim to address the research questions of the study. This will take place in the next section of this chapter – the one that focuses on the qualitative data.

4.2 Qualitative Data

4.2.1 Introduction to the section

A mixed methods approach was used for the purposes of this study, and the previous chapter explained the reasons why a combination of both quantitative and qualitative data collection process would be beneficial for any type of study (3.1). Having already looked at the

quantitative data findings through a series of descriptive statistics, the qualitative data that has been collected will attempt to address the research questions through the scope of the participants themselves. The responses that have been collected through the questionnaires and the interviews that were conducted with a specific number of participants allows the readers of this study to understand the importance to master the English language and use it effectively, to get a better idea of the types of mistakes Greek learners make – as well as the areas in which they make these mistakes, as well as the importance of having their mistakes corrected or not. As soon as the importance of error correction is evident in their responses, then the significance of applying various forms of technology in their learning journey, including the use of AI chatbots, becomes more relevant. Their responses in the interviews and the questionnaires reveal the attitude of the learners towards the use of AI and its implementation in language learning and allow us to decide if the use of AI can be a solution to the problem of persistent language errors due to fossilisation.

Data analysis for the collected qualitative data was achieved with the assistance of two pieces of software. Questionnaires were created and sent through the use of an online survey tool, which was also responsible for collecting the responses of the participants and visualising the responses of the participants in relevant infographics. On the other hand, the interviews were analysed through the use of NVIVO. The frequency of the participants' responses and the use of certain key words was coded and matched with nodes that represent specific attributes of the research questions. The visuals and tables for the collected data will be presented in the order it was collected, starting with the questionnaires first, and then moving to the interviews.

It should also be noted that the participants' interviews took place many months after they answered the questionnaires that were given to them, a fact that influenced some aspects of the Methodology, as discussed in Section 3.2.2. While interviews had always been planned for

the triangulation of the collected data and the additional validity of the research project, some unexpected occurrences led towards this unfortunate outcome. While the attitude and the participants' points of view have not been significantly altered, some of the participants do not express the same level of positivity in regard to the role AI is expected to play in education. Of course, this is something that should be left for discussion in an upcoming part of the current thesis.

The next part of the chapter attempts to present the qualitative data findings. Section 4.2.2 and its sub-sections have been organised after analysing the questionnaires of the participants and grouping their responses into relative groups. Section 4.2.3 has been organised after analysing the interviews and the responses collected from the participants, and organising them in tables, which reflect on the frequency of their responses. The Appendix section includes full tables with the participants' responses for further reference.

4.2.2 Findings from the questionnaires

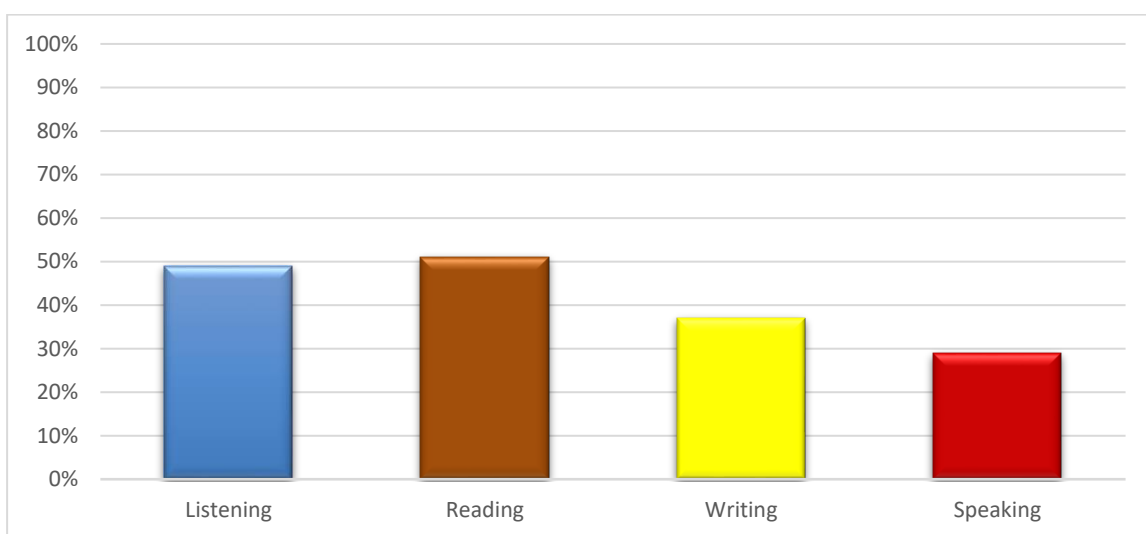
As mentioned before, this section includes tables and figures that have been designed after the completion of the analysis of the participants' questionnaires. It should be noted that only the questions which provide answers to the research questions of the study are included and discussed in this chapter. Demographic questions, for instance, have not been considered for the analysis.

4.2.2.1 The skills adult learners of English feel more comfortable with

One of the questions that was asked in the questionnaires was about the English language skills that Greek adult learners of English feel more comfortable with. This question attempts to add more information in the existing literature, by detecting the skills which adult Greek learners

of English usually do better and, consequently, make fewer mistakes. The following table provides some more information about the skills which attract a higher performance rate by Greek learners.

Table 4.15: Skills Greek learners are more confident with



The responses in this question revealed that reading proficiency stood out as the most notable skill among Greek learners, garnering responses from more than half of the participants. This indicates a significant strength in their ability to comprehend written English texts. Additionally, listening emerged as the second most preferred skill, with 49% of participants acknowledging their aptitude in this domain.

Moving on, the results demonstrated that writing proficiency ranked third among Greek learners of English, with a mere 37% expressing comfort in their written language output. This suggests a comparatively lower level of confidence in their ability to produce coherent and grammatically accurate written English. Lastly, speaking proficiency emerged as the skill with

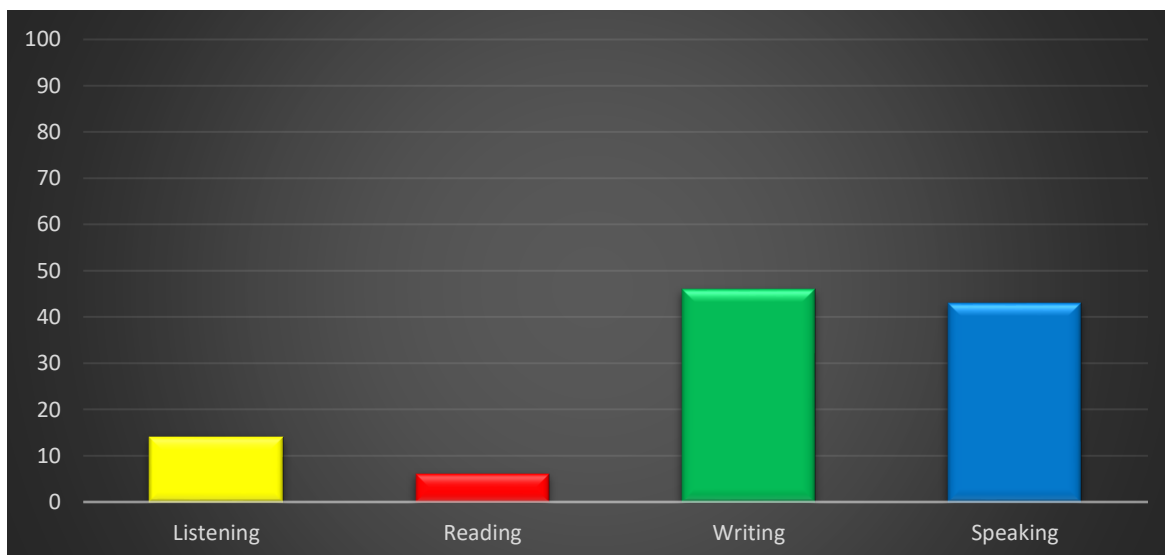
the least perceived strength, as indicated by a modest 29% of participants considering themselves exceptionally competent in oral communication.

While these findings represent only a small number of participants and cannot be considered as the norm, they still can be indicative of the general performance of Greek learners of English, due to the way they approach the language during the early stages in learning, as well as the structure and the materials they have been exposed to during their learning journey. What is more important, though, is to examine whether these findings match with those of the next question – the areas they find more challenging and are prone to making more mistakes.

4.2.2.2 English language skills that attract a higher number of mistakes

The responses of this question are supplementary to those in the previous one. The provided answers are expected to provide outcomes that are logical and in conjunction with what Greek learners of English believe about the English language skills they usually perform better. The following table provides a clear comparison of the four English language skills and the frequency of mistakes that they seem to attract from Greek learners of English.

Table 4.16: English language skills that attract more mistakes



The present set of responses align consistently with the previously collected data, revealing a noteworthy correspondence between the participants' proficiency levels and the prevalence of errors across different language skills. It is evident that areas in which the participants demonstrate competence tend to exhibit fewer mistakes, while conversely, the skills in which they are less proficient tend to attract a higher incidence of errors.

Once again, the data confirms that Reading remains the most proficiently performed skill among Greek learners of English, with a minimal percentage of encountered errors (6%). Similarly, Listening stands out as an area in which Greek learners generally perform well, with only 14% of participants admitting to making mistakes. In contrast, Speaking presents a notable challenge for learners, as 43% of the participants express difficulties in this domain. Furthermore, Writing proves to be another problematic skill, responsible for the highest rate of errors observed in their language learning journey, with 46% of learners reporting struggles in this aspect.

It is important to acknowledge that these percentages may not offer an exhaustive representation of the challenges faced by adult Greek learners of English in each language skill, but they serve as indicative measures of the prevailing situation. Considering the lack of existing literature on the specific difficulties encountered by adult Greek learners in relation to individual language skills, the present findings can serve as valuable references for future studies aiming to explore this domain in greater depth.

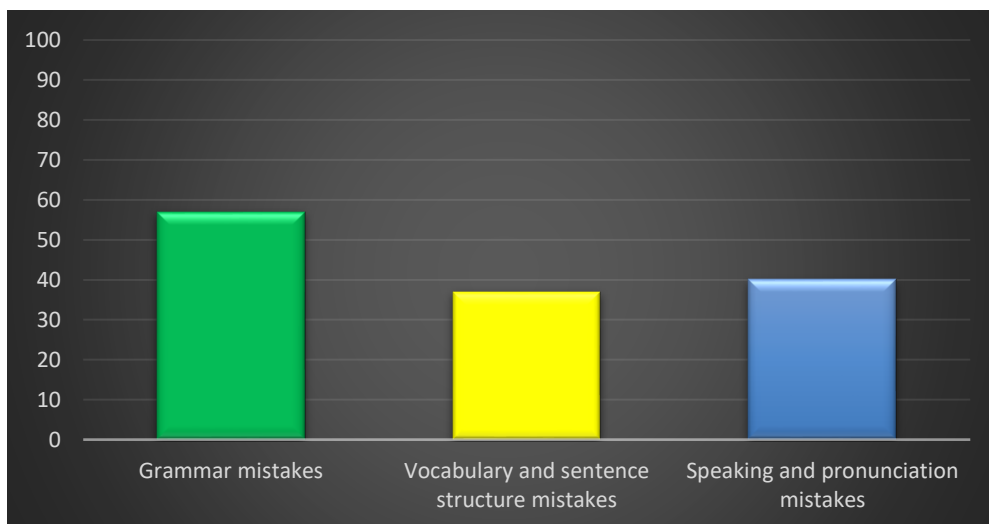
To advance the understanding of the underlying issues, the subsequent research should delve into the nature and types of mistakes commonly encountered in the identified problematic areas. By identifying and comprehending the significance of these errors, the study can

contribute to a more thorough analysis of the challenges faced by Greek learners of English and potentially inform the development of targeted instructional interventions to address their specific needs.

4.2.2.3 Types of mistakes that are made by Greeks.

After considering the skills that attract the higher rate of mistakes in the participants' linguistic output, the next prudent step would be to explore the types of mistakes that are made by adult Greek learners of English. These would include mistakes based on their overall grammar understanding, mistakes based on the vocabulary and sentence structure, as well as mistakes that are based on their speaking performance and include issues with their pronunciation. The following table includes information on these types of errors that the participants usually make.

Table 4.17: Types of mistakes made by adult Greek learners of English



The analysis of participants' responses regarding the types of mistakes they made presents a compelling and noteworthy discovery. Not only does it unveil the specific nature of these errors, but it also establishes associations with the corresponding language skills in which adult Greek learners of English encounter challenges.

The tabulated data reveals that a predominant proportion of the mistakes recorded pertain to grammar, constituting a significant 57% of the total errors. Pronunciation mistakes, typically observed in the Speaking skill, are made by 40% of the participants. Conversely, vocabulary and sentence structure errors appear to comprise a smaller portion of the responses, with 37% of the participants acknowledging their occurrence in their linguistic output.

Remarkably, these identified mistake patterns closely align with the English language skills that the participants exhibit difficulties with. It is evident that grammar and vocabulary/sentence structure mistakes are readily associated with Writing, emphasising the intricacies faced by learners in conveying ideas accurately and coherently in written form. Furthermore, the occurrence of pronunciation errors in Speaking underlines the challenges faced by adult Greek learners of English when articulating and pronouncing words correctly. In addition to identifying the types of errors, another intriguing aspect is to investigate the participants' attitudes toward recognising and self-correcting these errors. Noticing errors is something that is expected at the participants' language level, and self-correcting the errors that have been produced could indicate that the participants have taken the chatbot's indirect feedback into consideration and are now able to apply it in their work over time (Kang & Han, 2015). This specific investigation is connected to one of this project's research questions and holds paramount importance in understanding the Greek learners' capacity for error correction. Such insights may shed light on their level of metalinguistic awareness and self-monitoring abilities, which, in turn, could offer valuable implications for language instruction and learner support.

As the study delves deeper into the dynamics of error patterns and learners' responses, it becomes evident that a comprehensive understanding of both the nature of mistakes and the

learners' metacognitive processes is essential in designing effective pedagogical approaches and applying appropriate tools that will assist in addressing their specific language learning needs. The moment these become clear, the use of the AI as an intervention in the language learning process becomes more and more relevant, with even more possible applications in the teaching and learning context.

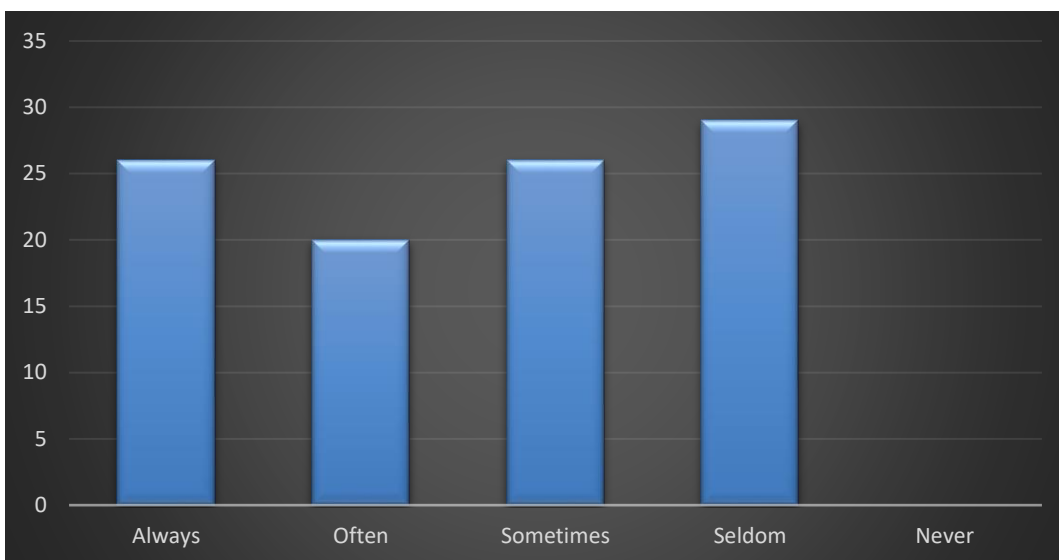
4.2.2.4 Greek learners of English and their attitude towards making and correcting them.

The following set of questions endeavours to explore the attitudes of Greek learners of English towards the occurrence and correction of mistakes in their language output. By delving into the participants' perspectives, this inquiry aims to gain comprehensive insights into their overall perception of mistakes and their significance in the language learning process. Moreover, these findings hold direct relevance to the second research question, thus contributing to a more comprehensive understanding of the learners' linguistic experiences.

More specifically, the questions focus on two aspects: the importance attributed to **noticing** and **self-correcting** mistakes before submitting any piece of work. Participants were prompted to provide their perspectives on these key dimensions, thereby providing valuable data to analyse their linguistic awareness and self-monitoring capabilities.

The table presented below offers a clear depiction of the participants' viewpoints on the significance of vigilance and self-correction concerning the mistakes they make in their language output. The responses garnered from this inquiry will be pivotal in gauging the extent to which Greek learners of English acknowledge and take responsibility for their errors before finalizing and submitting their written work.

Table 4.18: Frequency of noticing/self-correcting



According to the data presented in the table, the participants' responses indicate a lack of consensus regarding the frequency and significance of noticing and self-correcting mistakes in their oral and written output. As language learners, each individual holds their own distinct perspective on the matter.

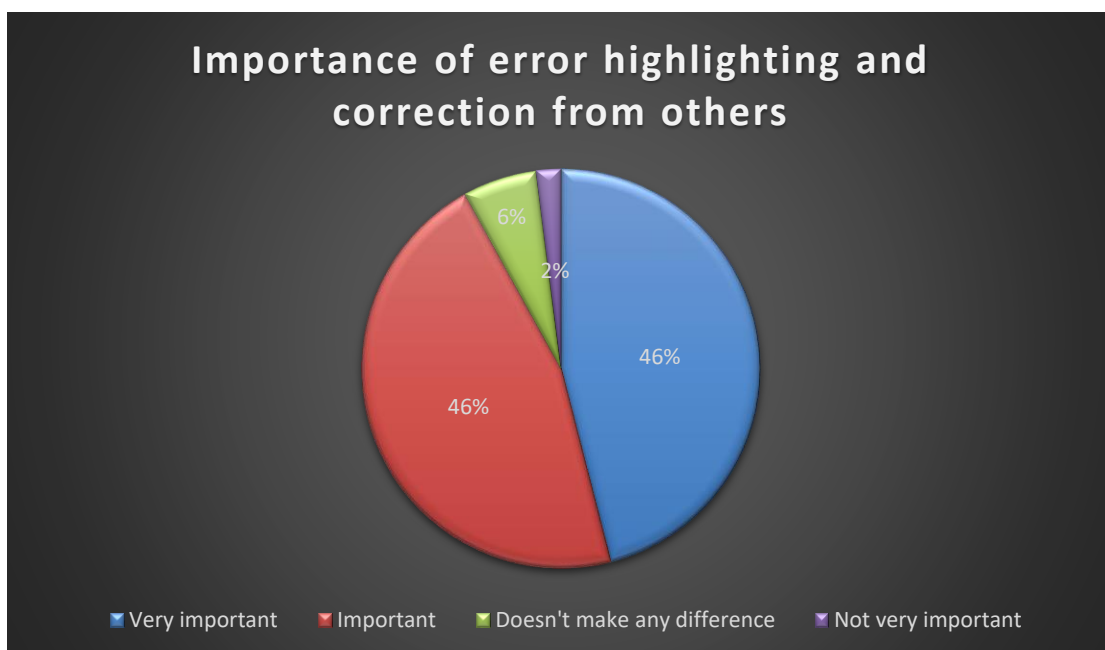
Approximately a quarter of the participants (26%) reported diligently checking their documents and engaging in self-correction when identifying mistakes in their written work or speech. For another fifth of the participants (20%), the act of noticing and self-correcting mistakes is a frequent practice, though not executed consistently. While they aspire to improve in this area, they acknowledge the practical challenges in achieving complete error eradication. Another quarter of the participants (26%) expressed that while they are familiar with the practice of noticing and self-correcting their mistakes, it does not occur consistently in their language output. For the majority of the participants (28%), the act of noticing and self-correcting mistakes is not a top priority, with such occurrences being infrequent.

Despite the divergent responses, it is essential to recognise that none of the participants entirely neglects the importance of addressing mistakes in their language learning journey.

Irrespective of the degree and frequency of their self-correction, the willingness to acknowledge and address errors underscores their commitment to learning and language improvement.

Moving ahead, the subsequent question aims to explore whether adult Greek learners of English express an interest in receiving external assistance with error identification and correction. Even if some learners may not prioritise self-correction, understanding their receptivity to having their mistakes highlighted and corrected by others is of significant interest. The next chart provides insights into the participants' preferences in this regard.

Table 4.19: Importance of error highlighting and correction from others



The data obtained from the participants' responses in this question highlights the positive disposition of adult Greek learners of English towards having their mistakes highlighted and corrected by others. A substantial majority of the participants relies on external assistance for error identification and correction, indicating the significance they attribute to this aspect of their

learning process.

Remarkably, an equal proportion of 46% of the participants view the highlighting and correction of their mistakes by others as either "very important" or "important" for their language learning experience. This highlights and stresses the importance of the fact that external feedback plays in their language proficiency development and their receptiveness to constructive criticism for improvement. In contrast, a small percentage of respondents (6%) express a more neutral stance, indicating that having their work corrected by others does not particularly impact their learning experience. Additionally, a mere 2% of participants firmly assert that the correction of their mistakes by others is of no interest to them.

The combination of these findings serves to provide a comprehensive understanding of the learners' attitudes towards both self-correction and external correction support. The participants' willingness to seek external feedback and their positive regard for such assistance underline their commitment to refining their language skills and cultivating an environment conducive to error rectification and learning.

As this study progresses, the insights acquired from these responses serve as a pivotal starting point for addressing the second research question. However, before delving further into this aspect, there is another significant topic that requires consideration—the production and use of language without mistakes. Examining the learners' language output in terms of its accuracy and proficiency, alongside their attitudes towards mistakes, will provide a more holistic comprehension of their language learning journey.

4.2.2.5 The importance of producing error-free language in different contexts.

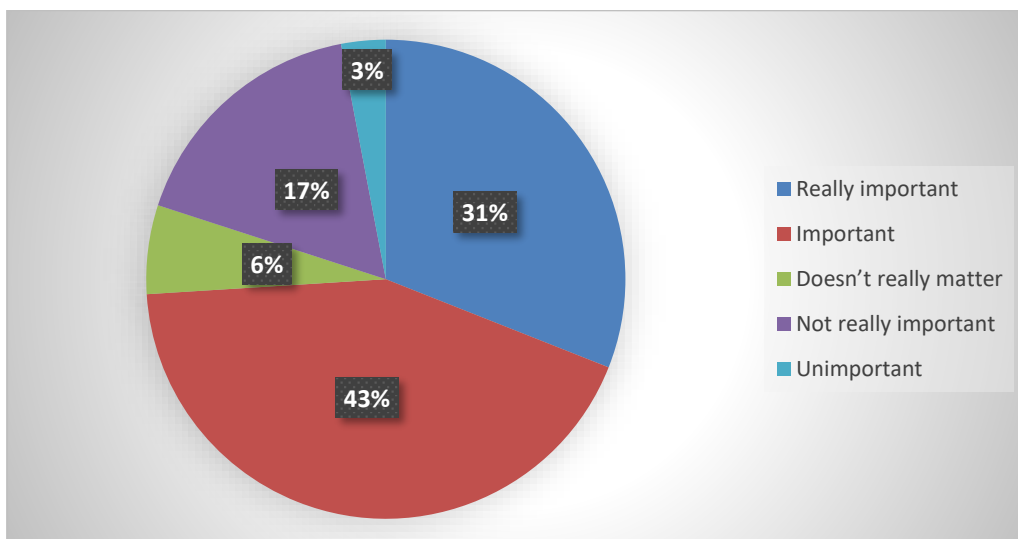
Continuing the presentation of the findings, the subsequent set of inquiries delves into a

captivating concept – the imperative of producing error-free language. The proficiency to generate linguistic output, be it oral or written, that includes no mistakes, is subject to numerous influencing factors and may manifest in a wide variety of contexts. This investigation is particularly pertinent when considering the multifaceted reasons why English holds significance for Greeks, as it has already been established in the first chapter of the thesis. It is evident that the need to achieve fluency without any apparent indication of English being a second language is of great interest to many individuals.

Therefore, the following questionnaires aim to gain deeper insights into the underlying mindset that drives English language users to utilise the language in a manner that masks its second language status. These questionnaires seek to explore the mentality behind striving for linguistic output in English that is both accurate and seamless, thus reflecting a higher level of fluency.

The initial chart presented in this section showcases compelling data derived from participants' responses, elucidating their perceptions concerning the level of importance attributed to producing English language output in diverse contexts.

Table 4.20: Importance of producing error-free language



Upon analysing the data presented in the chart, it becomes evident that a substantial majority of Greek learners of English (74%) exhibit a positive disposition towards speaking the language without committing any errors. Approximately one-third of the participants (31%) emphasise the utmost importance of producing error-free language, diligently striving to avoid any form of mistakes in their oral or written output. Similarly, 43% of the respondents share the same perspective, regarding error-free language as important, albeit acknowledging that occasional mistakes may not significantly impact the ultimate goal of effective communication with English-speaking individuals.

Conversely, a small segment of participants (6%) does not consider producing error-free output as a significant concern, viewing the presence or absence of mistakes in English language usage as inconsequential. Furthermore, only one-fifth of the participants (20%) demonstrate a more negative outlook towards the concept of error-free language production. Among them, 17% believe that producing English output without any mistakes holds no importance for their language proficiency, while a minute minority (3%) perceives the notion of making no mistakes while using English as entirely unimportant.

These differentiated attitudes towards linguistic accuracy and the significance placed on error-free language reflect the multidirectional perspectives of Greek learners of English. The variations in attitudes might be influenced by individual learning goals, cultural factors, or communicative contexts, underscoring the complexity of language acquisition and usage. This statement is also supported through the data that is collected from the interview and will be discussed later in the chapter. Further exploration of these attitudes and their implications could shed light on the psychology of language learners, addressing even the learners who could express the same levels of negativity regarding the production of error-free output, without any particular reason behind their insistence.

The subsequent inquiry aimed to reinforce the perspective on mistake production among the participants. They were presented with a hypothetical scenario, wherein they are engaged in communication with foreign individuals who speak English during their work, academic activities or any other studying-related context. Within this context, the participants were prompted to describe their typical behaviour concerning the use of the English language in their communications with the foreign speakers. Their responses were diligently recorded and are presented in the ensuing table.

Table 4.21: Communicating in English during work/studies.



The responses gathered from the participants within the framework of a hypothetical work or studies-related context shed light on their positive attitude towards producing error-free language when communicating with foreign English speakers. The majority of participants (71%) exhibit a conscious effort to display their English language proficiency by being meticulous and thorough in their language usage. While recognising that some inadvertent

mistakes may occur, 14% of participants express their commitment to accurate and efficient communication with foreign counterparts, hoping that the intended message will be effectively conveyed despite occasional errors. In contrast, 9% of the participants embrace the inevitability of mistakes in their linguistic output, acknowledging that it may pose challenges to communication. Nevertheless, they exhibit a strong willingness to engage in communication with foreign peers, despite the potential hurdles. A minor proportion (6%) of participants confess to resorting to a translation-based approach from Greek to English, acknowledging its inherent issues and the likelihood of producing a considerable number of errors in their output. Despite this, they remain steadfast in using the language in this manner, even if it impacts message comprehension.

Upon analysing these responses, a noticeable trend emerges, indicating that adult Greek learners of English are determined to ensure the high accuracy of their linguistic output. In the worst-case scenario, they strive to minimise the occurrence of errors, thereby facilitating smooth communication with English-speaking peers and partners. This optimistic disposition is further corroborated by insights obtained from participants' viewpoints during interviews, which will be presented in detail later in this chapter.

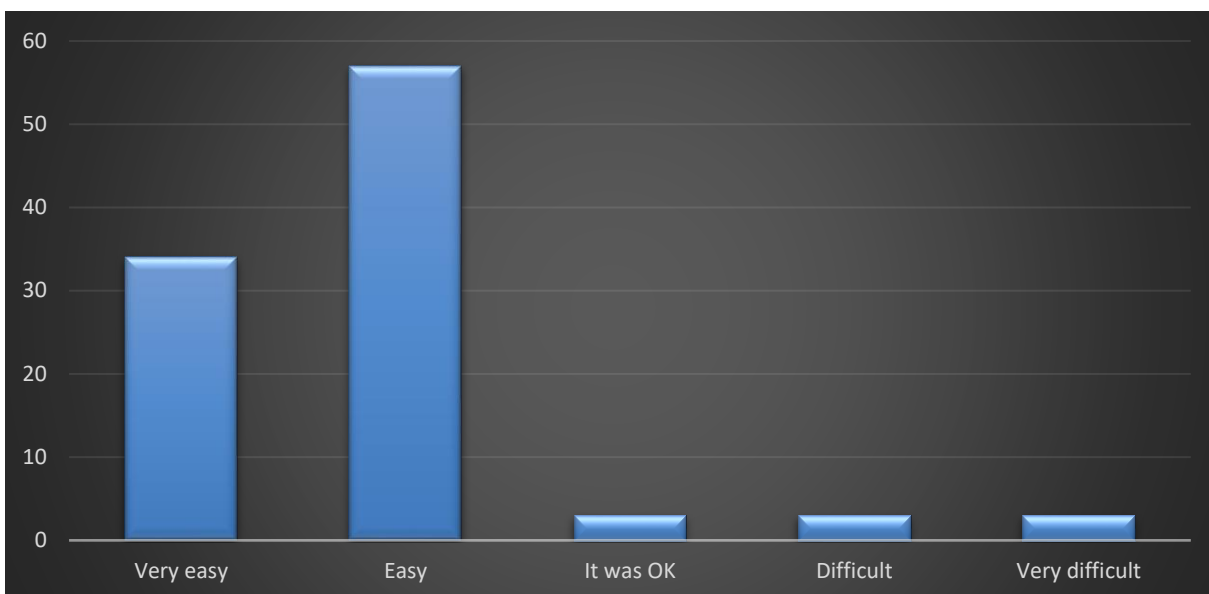
Having effectively established the significance of mistakes in the language learning process for Greek learners of English, a crucial aspect that aligns with the second research question, the subsequent set of questions attempt to delve into the participants' perspectives on the integration of technology and AI in education. Their valuable insights will provide worthwhile input for further examination and interpretation in the upcoming part of the chapter and will also provide a useful link with the research questions, something that will be fully explored in the next chapter.

4.2.2.6 Greek adult learners of English and their attitude regarding the use of technology and the AI in the learning context.

The final set of questions that was directed towards the Greek adult learners of English aimed to explore their attitudes and opinions concerning three distinct aspects: the broader concept of technology integration within the classroom and the learning process in general, the specific utilisation of certain AI-related tools to enhance their overall learning experience, and their perceptions towards the future role of AI in the learning journey. These questions sought to delve into the participants' perspectives on the concept of technology-enhanced teaching, the accessibility and effectiveness of such tools, and the overall place of AI within this educational context.

The initial question sought to investigate the participants' mindsets regarding the inclusion and usage of various technology tools employed during the study, including scheduled Microsoft Teams sessions for the bi-weekly teaching sessions, homework submission through Google Classroom, and the selection of one of two available AI chatbots for a chat-based activity, the transcript of which was sent through email. While these tools are commonly used and designed in a way that make them user-friendly, there is a possibility that some participants may encounter challenges in utilising them effectively and efficiently. The forthcoming data presented in the ensuing section will elucidate whether this assumption is true or not.

Table 4.22: How easy was to use the requested forms of technology during the study?



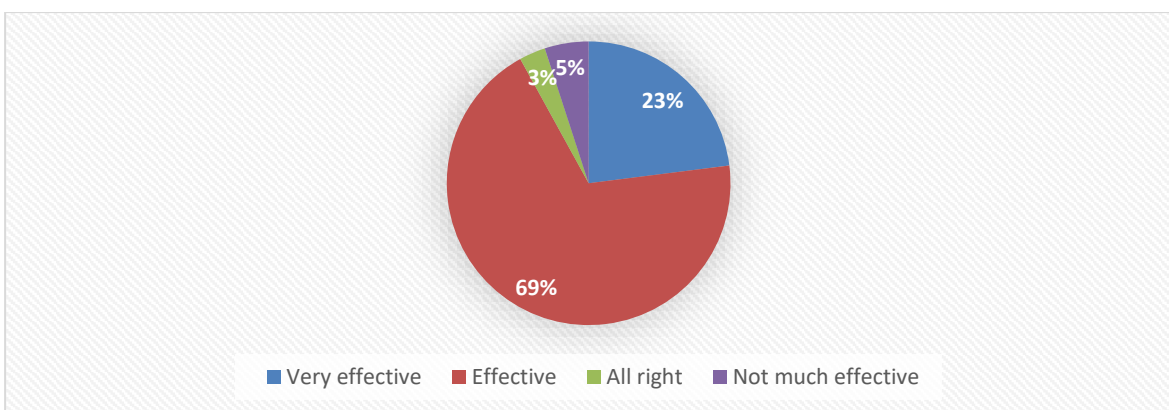
Contrary to any initial fears and hesitations regarding potential challenges posed by the diverse forms of technology employed in the study, it appears that such concerns were largely unfounded. The overwhelming majority of the participants (91%) expressed that using the designated forms of technology presented no difficulties to them throughout the study. Among these participants, 34% considered the utilisation of these technological tools to be exceptionally easy, while 57% found it sufficiently easy and accessible, with few issues troubling them. A modest proportion (6%) of the participants acknowledged encountering serious challenges while engaging with the technology, a fact that does not allow them to be positive towards it. Within this proportion of participants, 3% reported experiencing difficulty in its application, while another 3% perceived it to be exceedingly challenging during their learning journey. An additional 3% maintained a more neutral stance, acknowledging that while using the designated technology felt relatively straightforward, they did encounter some minor challenges.

The data derived from this question reveals that adult Greek learners of English exhibit commendable proficiency in utilising various forms of technology in an efficient and effective way. It is evident that a significant number of participants are likely well-accustomed to using such technological tools for various purposes, extending beyond language learning and

encompassing daily activities. However, it is important to note that a minority of participants may not be entirely familiar with certain technological tools, and as a result, may have required additional time and effort to attain proficiency.

Having confirmed the participants' optimistic perspective towards the facilitation and accessibility attributes of the technology implemented in the study, the subsequent question seeks to delve into the participants' actual experiences and reactions to the utilisation of technology during the learning process. Although the requested forms of technology may have been perceived as straightforward by the participants, a thorough look into their prime perception of the role technology is expected to assume in the context of learning is of great interest. In this regard, the following chart presents essential data that endeavours to address and illuminate this question in a comprehensive manner.

Table 4.23: How effective is the use of technology in teaching?



The analysis of the questionnaire responses reinforces the positive disposition of adult Greek learners of English towards the effective integration of technology in the learning

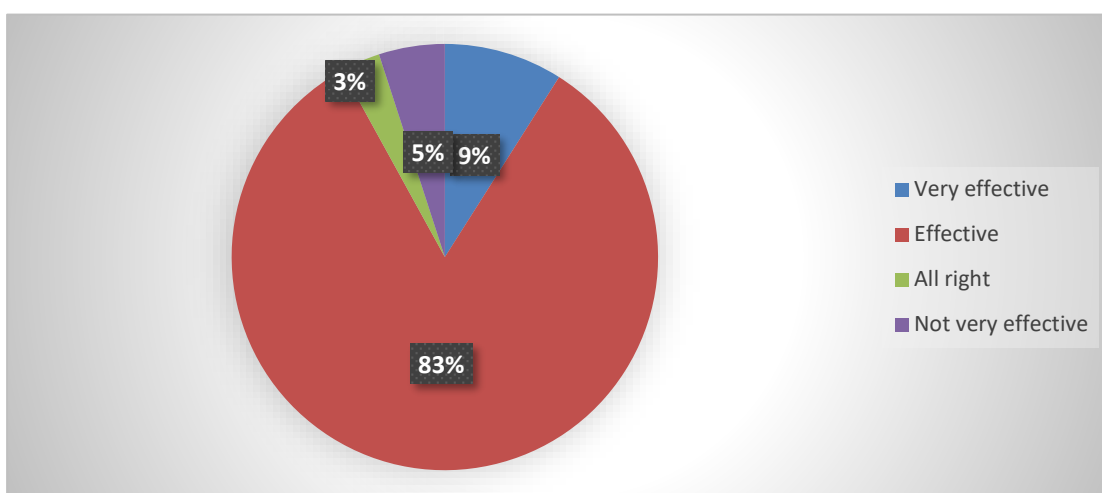
environment. The data reveals that a significant majority of the participants (92%) hold a favourable view of the role technology plays in the learning process. Among them, nearly seven out of ten participants (69%) perceive technology as a highly effective tool that can be fully harnessed to drastically enhance the learning experience. In addition, 23% of the participants exhibit an unequivocal embrace of technology's use in the learning context, expressing no reservations about its unconditional adoption. On the other hand, a small minority of the participants (5%) does not recognise the value of incorporating technology in the learning context, while an even smaller percentage (3%) adopts a neutral stance, refraining from expressing either positive or negative sentiments concerning the effectiveness of the technology tools that are used during the learning stage.

The observation that adult Greek learners of English not only display comfort in using technology for various purposes but also enthusiastically embrace it in the learning process is to be expected, given their familiarity with the aforementioned forms of technology that are frequently employed in their daily lives. Such familiarity and proficiency in using these technologies likely contributes to their positive attitude towards incorporating technology in the learning context. However, it is important to note that the AI tools (chatbots) employed in this study represent a novel and unfamiliar technology for most participants, distinct from the tools they commonly encounter. Consequently, the level of acceptance and enthusiasm towards AI may differ significantly from that towards more familiar technologies.

As AI technology is perceived as something new, strange, and unfamiliar, a form of technology that is specifically introduced for the purposes of this research, participants may not attribute the same level of positive acclaim to it as they do to more familiar technological tools. It is evident that the participants' experience with technology in their daily lives plays a vital role in shaping their attitude towards the AI intervention.

Given the potential differences in perceptions between familiar technologies and AI, the final two questions in this set aim to explore the current place of AI in the learning context. The subsequent chart seeks to reveal the participants' present stance regarding the effectiveness of AI within the learning process that took place during the study.

Table 4.24: Effectiveness of the AI tools in the study



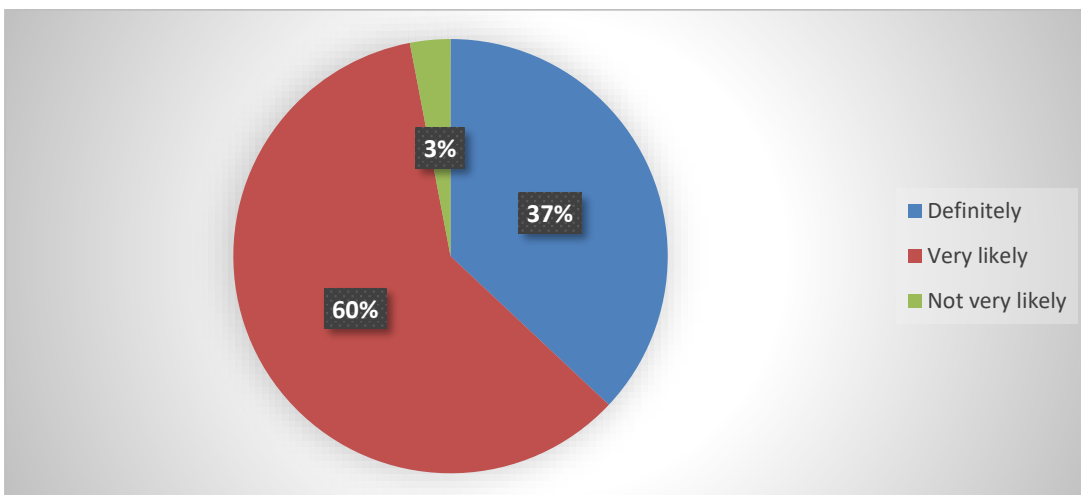
In spite of the novelty of AI tools for adult Greek learners of English and the necessity for participants to follow instructions and seek guidance on using the chatbots (during the early stages of the study at least), they have demonstrated an appreciation for the overall effectiveness of AI in their learning experience during the study. An overwhelming majority, comprising 92% of the participants, indicates the participants' belief in the substantial value of employing AI-related tools within the context of language learning. Specifically, 83% of the participants asserted that integrating AI tools in language learning can prove to be an effective method that enhances the learning process. Additionally, 9% of the participants unreservedly endorsed the use of AI tools for language learning without any hesitation. Conversely, a mere 5% of the participants did not perceive AI as an effective tool for learning purposes, while only 3% chose

to maintain a neutral stance, abstaining from providing any explicit arguments, either in favour of, or against, the effectiveness of AI as a learning tool.

Upon closer examination of the data from the current question and its correlation with the data from the previous question, interconnecting (and, at the same time, intriguing) patterns emerge, particularly concerning participants with negative views towards any forms of technology, including AI. It appears that the positivity towards technology, whether in general technology or AI-specific, varies in distribution across participants in each inquiry, whereas the individuals expressing negative sentiments consistently remain a constant, stable, and static minority. Although the study's data is confined to a specific number of participants, these findings could offer valuable insights into the broader context. It is very possible, therefore, that this percentage may mirror real-life situations, with only a small fraction of learners expressing negativity towards the incorporation of technology or AI in education.

It is essential to consider this aspect when designing new language learning applications and technologies aimed at enhancing the educational experience. Despite the small number of negative responders, their perspectives are crucial, as they can provide valuable feedback on potential barriers during development of language learning-enhancement tools, as well as areas of improvement. This consideration gains significance in light of the data collected from the final question, which presents a clear picture of the participants' perspectives on the future of AI in education.

Table 4.25: How likely will the AI be an integral part of education in the future?



By comparing this data with the data from the previous questions, it seems that those who are more sceptical regarding the use of the AI in education are definitely fewer. Only 3% of the participants believe that the AI is not very likely to have a more permanent role in the future educational settings. Other than that, the rest of the participants are persuaded that the AI will be an integral part of the learning environment in the future, with 60% believing that using AI-related tools is very likely to be part of the future learning process, and another 37% already accepting that the use of AI in the future will be a definite possibility.

This final chart concludes the presentation of the findings that originate from the qualitative data collected from the questionnaire. The participants of the study have expressed their viewpoints regarding the language points in which they feel they are better, as well as those that have proven to be more challenging. They have showcased the types of mistakes typical Greek adult learners of English might make during their studies, as well as their opinion regarding the importance of addressing these mistakes. Most importantly though, they have voiced their preference towards the use of technology in the learning context and have suggested that there are benefits in applying AI technologies while learning.

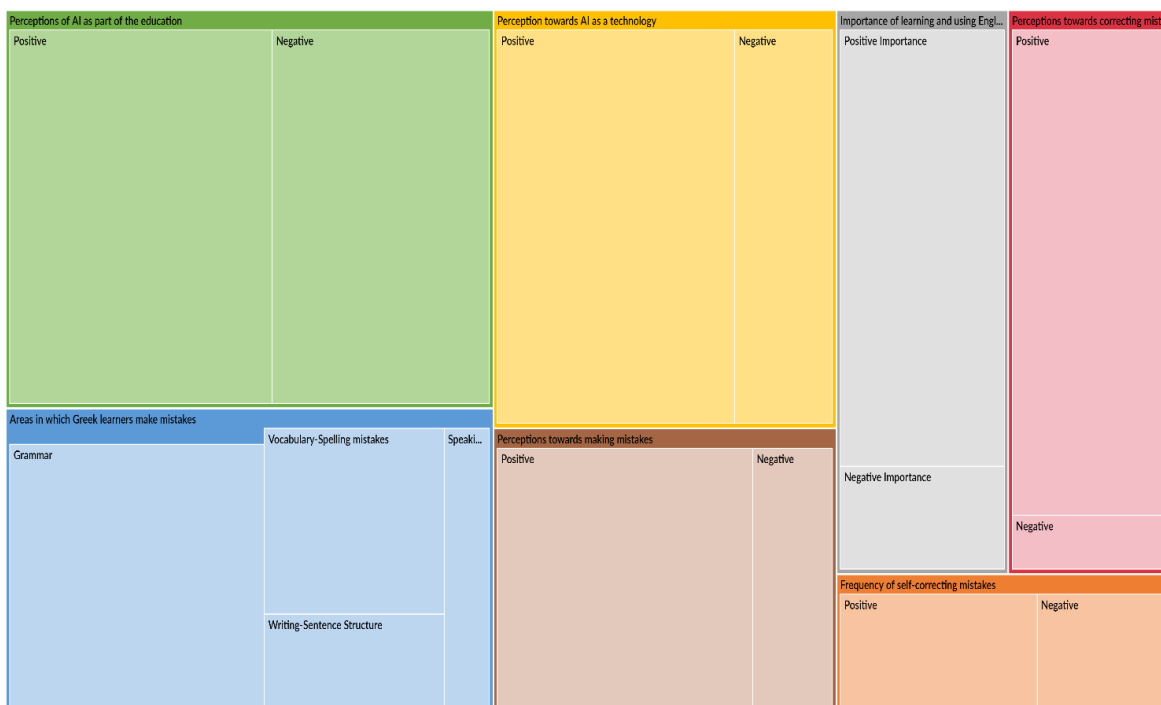
The next part of this chapter will focus on the opinions of the participants that have been interviewed. With the interviews having taken place many months after the date of the

questionnaires, it would be of great interest to investigate whether the opinion of the participants remains the same – especially considering the fact that, in these final questions, none of the participants have provided the most negative response that is provided in the questionnaires.

4.2.3 Findings from the interviews

The final segment of the qualitative data set attempts to explore and provide a clearer picture of the insights gathered from participant interviews. These interviews were meticulously transcribed and subjected to a coding process that was designed to align with the research inquiries and the viewpoints expressed on pivotal themes. The ensuing table provides an overview of the distribution of coded attributes across the participants' responses.

Table 4.26: Schematic presentation of the interview responses



In order to properly interpret the contents of the table above, a note should be made above the overall process of the interview analysis. The responses that were relevant to the research questions were categorised into seven groups, and specific words and phrases that address the research questions were isolated and assigned in the relevant group. Table 4.26 represents the important areas of focus in the participants' responses, while the positive and negative codes show the number of words and phrases that were assigned in each group. For instance, in the blue segment of the table, sub-categories further signify specific linguistic areas of concern, the size of which being a good indicator of the frequency of their occurrence, based on the participants' responses. In the green segment of the table, the participants' perceptions regarding the integration of AI as an educational tool are considered, while the yellow segment attempts to provide a clear image on how they are viewing AI as a technological entity. The answers appearing in the grey group reveal more about the importance of acquiring and employing English language proficiency across diverse contexts. The concluding three sectors shed some light on the participants' attitudes towards errors. The brown group is responsible for the visualisation of the participants' perspectives on the significance of committing mistakes in the learning process. The orange sector delves into participants' reflections on the frequency of

self-corrections. Lastly, the red sector investigates participants' feelings regarding the correction of errors they generate.

The subsequent tables provide more information regarding the range of codes that are allocated within each category. The numbers indicate the coded responses that match each sub-category and alternative response in the topics that were asked during the interviews. Table 4.27, for instance, presents the four areas of language in which the participants admitted making more mistakes, and the total number of words and phrases that were coded in each group:

Grammar	16
Speaking-Pronunciation	3
Vocabulary-Spelling	8
Writing-Structure	4

Among the participants, a notable observation emerges as their linguistic competencies are checked. While several participants manifest vulnerabilities in more than one skill or linguistic domain (e.g. Participant 31 admitted having difficulties both in grammar and pronunciation), a prevalent consensus emerges: grammatical errors take the first place as the most recurrent form of linguistic infraction. Following closely, spelling errors and lexical challenges occupy the secondary position in the hierarchy of language errors. Difficulties related to writing proficiency occupy the third place in terms of frequency appearance in the participants' responses, while spoken language aptitude lags behind as the fourth most frequently occurring source of errors.

It is evident that these participant responses exhibit consistency with the findings

garnered from the questionnaire. Once again, grammar surfaces as the most formidable facet of the English language, with other linguistic skills and domains presenting as relatively more accessible to the learners.

Table 4.28: Importance of learning and using English at a higher standard	
High importance	17
Low importance	4

An essential question that arose during the initial phases of project design pertained to the significance accorded by the participants, and by extension, Greek learners of English, to the attainment of linguistic proficiency at an elevated standard, and completely free from errors, if possible. Once again, when examining the data gleaned from the interviews, a remarkable consistency emerges in parallel with the responses that are provided in the questionnaire. The vast majority of participants favour prioritising the acquisition and utilisation of English language skills at a superior level. They acknowledge the importance of producing language devoid of errors, a conviction grounded in a multifaceted array of motivations and considerations.

For instance, Participant 26 admits that learning and using English at a high standard level is important for the successful completion of work-related projects, while Participants 21,31 and 12 mention their employment sectors (IT, finance and tourism) where the use of English at a high standard level is necessary. Another interesting point is one raised by Participant 10, who stresses that he needs to maintain a high standard use of English in order to keep up with communication with family members living abroad. Still, employment can be associated with the participants who expressed that it is not important to learn and use English at a high standard level, such as Participant 6, who is a primary school teacher and does not need to

use English in their working place.

Table 4.29: Perception towards AI as a form of technology	
Positive	22
Negative	9

By taking into consideration that the participants did not have prior experience to working with artificial intelligence technology, the data that has been collected from the participants' responses is consistent with those originating from the questionnaires. The interviewees still hold a positive opinion towards artificial intelligence as a form of technology, that can be beneficial to an amount of daily life situations, including education and language learning. The majority of the participants believe that AI can be a useful and helpful tool and admit that they enjoyed using it during the study. However, interviewees such as Participant 10 and 28 explicitly mention that "AI should not replace human interaction", or "the presence of a human teacher" respectively. This notion is mentioned by most of the interviewees, with only a few people being positive (e.g. Participant 14, who is enthusiastic towards the use of AI, and suggests that "would highly recommend AI chatbots) or negative (e.g Participant 32, who says that remains "somewhat sceptical about the extent of relying on AI for various aspects of everyday life")

Table 4.30: Perception towards the use of AI as part of the educational process	
Positive	23
Negative	19

The findings that have been extracted from the interviews exhibit a notable agreement with the responses recorded in the questionnaires, revealing a positive disposition among the participants toward the integration of AI within the educational framework. Nevertheless, a

noteworthy shift in sentiment becomes clearly evident when comparing the interview responses to the earlier questionnaire data. It is pertinent to recall that in the questionnaires, 91% of participants maintained a favourable perspective on the efficacy of AI tools, with an even more substantial 97% expressing approval for the utilisation of AI in the learning process. Within the interim period separating the questionnaire phase and the subsequent interviews, a noticeable transformation in participant viewpoints has transpired, with the participants maintaining the importance of the human factor in the learning process.

For instance, Participant 21 mentions that “AI is a tool that will be helpful in the classroom...but in combination with the teacher”, while Participant 31 says that “human interaction...and guidance from teachers...they can’t be replaced by any form of technology...”. Some participants are more negative regarding the use of AI as part of the educational process from the beginning, like Participant 12 who believes that “AI lacks the cultural understanding and the... sensitivity that a human teacher can provide”, adding also that “AI is only a piece of technology, but it does not have a heart...it does not have a soul”. Even so, they all seem to agree that there is merit using AI in the learning process, regardless of any objections they might raise.

Table 4.31: General perception towards making mistakes in the learning process	
Positive	15
Negative	5

The concluding series of inquiries, as manifested in the final tables, attempts to investigate the attitudes of participants concerning the errors they encounter. While error analysis has been a prominent aspect of this study since its inception, it was necessary to

establish whether the act of making and subsequently rectifying errors held genuine significance for the participants and, by extension, adult Greek learners of English.

The table presented above aims to examine the participants' perceptions regarding the occurrence of errors and mistakes within the learning process. Predominantly, a substantial majority of participants align with the perspective that committing mistakes bears immense importance within the learning environment and while it takes place. They believe that the process of making errors stimulates a more efficient and effective learning experience. According to Participant 31, making mistakes “is a natural part of learning a language”, and that “it is how we learn and improve”. Participant 28 mentions that making mistakes “is a... critical side of the process of learning a foreign language”, while Participant 12 says that making mistakes “is an integral part of learning”. Conversely, only a minor fraction of participants appears to bestow less consideration upon the errors they make, consequently ignoring the inherent constructive aspect embedded in the act of erring within the learning process. However, it seems that this attitude can be attributed to their personal perception of making mistakes in general. Participant 26 only mentions that they are “not feeling OK by making mistakes”, while Participant 21 says that “next time I will not repeat them”. Participant 19’s responses are of interest, as they “would just communicate ideas...and hope the other person understood them”, a trait shared by both Participant 25 (who stress that making mistakes in their working place is unacceptable) and Participant 11 (who admits that they keep going without thinking too much on the errors).

Table 4.32: Perceptions towards correcting mistakes in the learning process	
Positive	18
Negative	2

In terms of the frequency of perceptions regarding error correction within the learning process, it is appropriate to underscore the striking resemblance between the responses obtained in the interviews and those gleaned from the earlier questionnaires. Once again, participants demonstrate an appreciation towards the importance of having their errors and mistakes, which occur during the learning process, rectified by an external party rather than opting for complete disregard. The vast majority of participants exhibit a prevailing positive disposition towards the act of error correction within the learning process. In contrast, a small minority persist in their inclination to dismiss the significance of error correction, as evidenced by the recurrent thematic patterns observed in the responses elicited during the interviews. While these participants might not be completely against correcting mistakes, both Participants 19 and 11 do not think that “correcting every [single] mistake is necessary”, a perception fully disregarded by the rest.

Table 4.33: Frequency of self-correcting mistakes	
High	6
Low	4

The outcomes derived from the data presented in the concluding table seem to align with the observations gleaned from the previous questionnaires concerning the act of recognising and self-correcting errors. While the tendency for self-correction may not manifest as a commonplace occurrence among the majority of participants, a significant portion of them nonetheless seem to be able to recognise it and make an attempt to use it. For instance, Participant 10 explicitly says: “I make an effort to review my writing for errors and correct them.” Participant 28 expresses a similar point of view by saying: “I try to proofread my writing and try to identify any mistakes.” At the same time, a few participants concede to encountering challenges in the process of recognising and autonomously addressing linguistic errors, as

substantiated by the recurring thematic motifs evident within the compiled response frequencies. For example, while being generally positive and willing to self-correct mistakes, Participant 28 also says “I sometimes struggle to understand if I make mistakes while speaking... Speaking takes place...you know, more...unconsciously and there is no...not enough time to think if I am making a mistake...and if I have to correct it”, admitting that it is not easy to notice the produced errors and self-correct all the time. Finally, there are those participants who do not regard noticing and self-correcting of mistakes as something useful, though their statements are the minority. An example of this lies in the statement of Participant 19, who mentions that “I never paid much attention to the mistakes I made... I always believe that it's more important to get the message understood rather than focusing on speaking perfect English.”

This chapter attempted to present the actual findings that occurred from the analysis of the collected data. As expected, there has been minimal discussion about what each finding means in regard to each research question. The next chapter will associate the findings of the study according to the research questions used and will attempt to shed some more light over the findings, and what these might mean for the participants.

Chapter 5: Discussion of the findings

5.1 Introduction

The preceding chapter primarily concentrated on the presentation of findings obtained during the data collection phase. Given the research questions' distinct requirements for data collection, which were driven by the wide range of features and elements that required careful consideration, a mixed methods approach was adopted to effectively gather and analyse the collected data. The present chapter will provide a comprehensive examination and explanation of the implications of these findings for the study's effectiveness. The ensuing discussion chapter is structured into four distinct sections, with each section dedicated to one of the study's four research questions. All pertinent data will be properly developed and linked with relevant existing literature. The addressing of each section's discussions and the demonstration of how the data adequately deals with each research question could establish a potential merit behind the overall conduct of the study, and some possible research opportunities in the future.

5.2 Research Question 1: What are the written grammatical errors advanced adult Greek learners of English produce?

The first research question presented a particularly intriguing challenge, primarily due to its reliance on qualitative data collection methods, such as questionnaires and interviews. Quantitative data tools did not prove to be enough for addressing this specific question. Consequently, the design of the questionnaires and interviews was carefully orchestrated to elicit responses that would yield a comprehensive answer to this research query.

What made the exploration of this question particularly complex was the limited corpus of relevant research available to establish a contextual understanding of the nature of errors and mistakes commonly made by Greek learners of English. Existing studies (Andreou & Baseki,

2012; Kulocheri, 2014) primarily converges on the categorisation of errors made by Greek learners into two broad domains: phonology and grammar. These studies, however, albeit informative, comprise only a small part of the problem that refers to the general lack of research and studies that could be used to address this research question. A careful and detailed review of existing studies reveals a clear shortage of insights into the typology of errors and mistakes commonly encountered by Greek learners. In essence, the existing body of literature highlights the greatly visible gap in the general understanding of the error patterns exhibited by Greek learners of English. The available research provides only a partial glimpse into the multifaceted nature of errors in the Greek EFL learning context, emphasising the need for further comprehensive investigations to enrich the comprehension of the intricacies involved.

Turning to the quantitative and qualitative data collected and analysed, the evaluation of the study's success and its ability to offer a satisfactory response to the initial research question becomes more evident. A detailed summary of the findings derived from the descriptive statistics, generated for this research, appears on Table 4.2. The initial category of interest is the **mean score**, which signifies the average score of the percentages of correct language use before and after the moment the AI chatbot intervened. Some figures are lower, meaning that the participants encountered greater difficulty in the respective session, while some figures are higher, meaning that the participants found the session comparatively easier. Subsequently, attention turns to the **standard deviation**, a metric used to gauge the dispersion or variability within the data. A higher standard deviation points to more pronounced variability in the participants' performance, potentially indicating greater challenges or difficulties in that session. Conversely, a lower standard deviation reflects the relative consistency and proficiency of participants in the context of the specific session. Finally, the **standard error** also holds significance in the analysis, as it provides an estimate of the variability of the sample mean. It plays an important role in assessing the precision of the mean. A smaller standard error value

implies a more dependable mean estimate, while an increase in the standard error value suggests a less reliable mean estimate.

The purpose of this section, though, is not to provide a statistical analysis, but to interpret what the findings mean for the research question. Taking all this information into account, it becomes possible to identify the sessions that posed greater challenges to the participants compared to those that were relatively less demanding. The degree of difficulty can be defined by considering the areas with the lowest median scores for the pre-intervention percentage of correct language production, and the highest standard deviation scores for the pre-intervention percentage of correct language production. The analysis of the data allows for the ranking of sessions from the most difficult to the least difficult, commencing with the most challenging ones:

- a) **Wish/Unreal Past:** Mean = 0.574, SD = 0.372, SE = 0.064, CV = 0.649
- b) **Gerunds/Infinitives:** Mean = 0.936, SD = 0.179, SE = 0.031, CV = 0.191
- c) **Prepositions:** Mean = 0.931, SD = 0.170, SE = 0.029, CV = 0.182
- d) **Modal Verbs:** Mean = 0.926, SD = 0.185, SE = 0.032, CV = 0.199
- e) **Word Order/Inversion:** Mean = 0.784, SD = 0.248, SE = 0.043, CV = 0.316
- f) **Passive Voice/Causative Form:** Mean = 0.686, SD = 0.253, SE = 0.043, CV = 0.368
- g) **Conditionals:** Mean = 0.623, SD = 0.244, SE = 0.042, CV = 0.391
- h) **Reported Speech/Subjunctive:** Mean = 0.642, SD = 0.233, SE = 0.040, CV = 0.363
- i) **Present and Future Tenses:** Mean = 0.600, SD = 0.276, SE = 0.047, CV = 0.460
- j) **Articles:** Mean = 0.804, SD = 0.244, SE = 0.042, CV = 0.304
- k) **Past Tenses, Used/Would:** Mean = 0.696, SD = 0.226, SE = 0.039, CV = 0.324
- l) **Phrasal Verbs:** Mean = 0.968, SD = 0.089, SE = 0.015, CV = 0.092

In light of the collected data mentioned above, the session dedicated to "Wishes and the

Unreal Past" exhibited the lowest mean score and the highest standard deviation rate, signifying that it presented the most significant challenge to the participants. Conversely, the session focusing on "Phrasal Verbs" was found to be less challenging. In the context of the existing literature and related research, it appears that "Phrasal Verbs," "Tenses," and "Articles" are grammatical phenomena that do not seem to pose substantial difficulties for the study's participants, who represent adult Greek learners of English. At the same time, it is evident that more intricate phenomena, such as "Conditionals" and "Reported Speech," introduce a higher level of challenge to the study's participants, aligning with the findings in existing research.

The important thing, though, is the association with the existing literature. By using Papaefthymiou-Lytra's study (2001) as a starting point, there seems to be a strong connection between her findings and the findings of this study. Even though the pool of the participants definitely leaves some room for doubt, as there is a possibility that these findings might not be relevant to all the Greek adult learners of English, this connection seems to be a good starting point and the beginning of additional research that could further strengthen this claim. Additionally, the cumulative data suggests that grammar represents the most challenging domain within the English language for Greek learners. This assertion implies that highest number of mistakes and errors made by adult Greek learners primarily apply to grammar-related issues. However, it is worth noting that grammar constitutes just one facet of the English language, one that is intrinsically linked to various language skills. It should also be noted that existing research primarily addresses grammatical aspects, with few of them addressing other aspects, such as phonology. Consequently, it becomes important to explore the participants' perceptions regarding other forms of errors and mistakes that may manifest across diverse linguistic dimensions. This line of inquiry could be addressed through the qualitative data collected via questionnaires and interviews.

Upon examination of the data presented at Table 4.15 and 4.16, featured in Chapter 4, it becomes evident that "Writing" and "Speaking" are the two domains associated with a higher frequency of errors and mistakes. Specifically, these two language skills, "Writing" and "Speaking," appear to be particularly susceptible to errors and are characterised by a lack of confidence among the participants when utilising them for communication purposes. Notably, grammatical errors are not uncommon in both "Writing" and "Speaking." This observation aligns with the quantitative data derived from the study and is consistent with the limited body of existing literature.

Table 4.17 offers insight into the responses provided by the participants concerning the specific types of mistakes they tend to produce. The information on this table confirms the findings of previously conducted research projects, as well as those of this research project. Grammar issues are dominant on this table, with speaking and pronunciation issues following, and vocabulary or sentence structure related issues occupying the third place in the table. The analysis of the responses coming from the interviewed participants also seem to confirm the above, according to the information of Table 4.27, which also appeared in the previous chapter.

The predominant category of mistakes in the linguistic output of the participants, who represent adult Greek learners of English, remains grammar-related errors. Interestingly, with the interviews conducted a year later, a noticeable difference in the types of mistakes across various language aspects emerges. Vocabulary and structure-related errors appear to surpass speaking and pronunciation-related errors. This discrepancy suggests a potential area for future research; however, it is important to note that the number of interviewees was smaller than the total number of participants who responded to the questionnaires, which could account for this variation in responses.

At this point, it would be safe to admit that, despite the scarcity of research on errors produced by Greek learners of English, the data deriving from the questionnaires and the interviews seems to suggest that written grammatical errors seem to be the types of errors most frequently encountered in the linguistic output of these participants, and it is likely that this applies to the extended pool of adult Greek learners of English. “Wishes and the Unreal Past” is the phenomenon whose carefully designed instruction could benefit Greek learners more, while “Phrasal Verbs” could continue being part of a syllabus, but one which does not require more attention than usual. Vocabulary and spoken English issues, while they do emerge in the participants’ responses, do not present the same level of difficulty for the participants, a trait that could be true for a higher number of adult Greek learners of English. Of course, this study could be as a starting point for additional research on the types of occurring errors, covering all the other language skills in more detail and effort, and keep filling gaps in the existing literature.. Additionally, in an attempt to make a link of these findings to one of the pillars of this research project, which is fossilisation, it can be said that no matter whether these errors emerge, advanced learners of English are able to successfully address them, as the findings have shown.

5.3 Research Question 2: What is the learners’ perception regarding producing and correcting written grammatical errors of English?

The second research question was deliberated early in the research project's inception. The significance of fossilisation, wherein learners persistently retain erroneously acquired elements of the English language, laid the foundation for this study. Furthermore, the study aimed to harness various technological approaches to investigate the prospect of rectifying the recurring use of incorrect linguistic elements among advanced learners. Central to the research endeavour was an exploration of the perspectives held by the study's participants regarding language mistakes. As a result of this, it felt necessary to examine the importance attributed to

the **act of making mistakes or errors**, as well as the **significance of rectifying these linguistic inaccuracies**.

Correcting language errors is essential for various reasons, supported by numerous studies. According to Sheen (2007), corrective feedback significantly benefits learners, especially those with a positive attitude towards error correction and high language proficiency. Errors guide learners in identifying areas needing improvement and directing their learning process (Widiasuti & Setiawan, 2016), and correcting these enhances writing skills by increasing self-awareness of linguistic inaccuracies and improving accuracy and fluency (Yin et al., 2012).

Moreover, error correction facilitates effective communication by ensuring clarity and comprehensibility, thereby preventing misunderstandings (Sharma & Tripathi, 2018). Error analysis provides insights into language acquisition, helping educators refine their teaching strategies, as suggested by Jabeen et al., (2015). Empirical evidence supports the benefits of correcting written errors, as it helps learners develop both explicit and implicit language knowledge (Shintani & Ellis, 2013). Additionally, active self-monitoring and self-correction by learners are crucial. This process enhances self-awareness of linguistic difficulties, reducing repetitive mistakes (Saeb, 2017), and is integral to the language learning journey, according to Widiastuti & Setiawan (2016).

Other studies suggest that self-correction fosters discipline, precision, and reflective thinking, empowering learners to take ownership of their language learning (Garrison et al., 1999; Nugroho et al., 2022). It should also be noted that the act of noticing and self-correcting language errors plays a pivotal role in the feedback loop. Feedback that emphasises the significance of effort and the learning process, including the acceptance of mistakes, has the potential to elevate the quality of learning and performance (Shute, 2007). It serves to enlighten

learners that mistakes should not be viewed as failures but rather as opportunities for personal growth and improvement.

In the realm of foreign language teaching and learning, errors are widely recognised as an integral component of the learning process (Silva et al., 2018). Teachers assume a pivotal role in this process by delivering constructive feedback to learners, aiding them in the identification and rectification of language mistakes. However, it is imperative for educators to strike a delicate balance between rectifying every single error and prioritising effective communication (Saeb, 2017). While addressing all errors may certainly heighten learners' awareness of their linguistic challenges, an excessively exhaustive focus on error correction has the potential to overwhelm learners and, unsurprisingly, impede the flow of effective communication.

Because of all the aforementioned reasons, as they have been established in existing studies, the omission of establishing the participants' perspectives on error identification, marking, and self-correction would have constituted a notable gap in this study. Consequently, participants were afforded the opportunity to articulate their viewpoints through both questionnaires and interviews. While the number of interviews conducted was relatively fewer compared to the volume of questionnaires, the responses gathered from the interviews were substantively consistent with those obtained through the questionnaires.

A look at Table 4.18, appearing in the previous chapter, could offer insight into the attitudes of the participants concerning the errors they encounter and their subsequent management. That table illustrates that the participants' inclination towards noticing and self-correcting their language errors is not a foreign concept to them. While there is some variation in the collected responses, the participants have been encouraged to engage in a degree of self-proofreading in their work, enabling them to detect and rectify errors and mistakes. The

frequency of this practice is intriguing, with over half of the participants occasionally neglecting to review their work, in contrast to the remaining participants who appear to engage in proofreading and language correction more regularly. Such variability is entirely anticipated, given the individuality of each participant and the specific context in which their language output is produced. Nevertheless, these observations regarding their attitudes towards error correction indicate a generally strong command of the language, as expected at an advanced level, and a constructive disposition towards improving their linguistic proficiency.

Nevertheless, as previously discussed, error correction can take place through various channels and opportunities within the learning process. In addition to self-correction, learners may anticipate that others, such as peers or tutors, will review and rectify their work. Regardless of the source, it is essential to explore learners' attitudes towards error correction by others. Even though it is an integral aspect of the learning journey, there might be learners who are not entirely comfortable with the prospect of having someone else evaluate and edit their work. Table 4.19, which can also be found in the previous chapter, does provides responses that seek to shed light on the matter of error highlighting and correction from others, either peers or instructors. According to that table, while it appears that the study participants are well-acquainted with the concepts of recognising and self-correcting the errors in their linguistic output, it does not necessarily imply that they feel entirely at ease with this process. The fact that more than 90% of the participants acknowledge the significance of error identification and correction by others strongly suggests that, given the opportunity, they would readily seek external assistance to have their errors pointed out and rectified. This inclination is underpinned by their comprehension of the importance of making mistakes as an integral part of the learning process, as well as their belief in the value of error generation and correction as fundamental components of learning. A look at the data from the interviews, as this appears in Table 4.19, could further confirm this hypothesis, as the majority of the participants who were questioned do

not feel discouraged from the fact that mistakes and errors are evident in the learning process.

When questioned about their perception regarding the role of error-making in the learning process, the interviewees expressed strong and predominantly positive viewpoints. Following the coding of the interviewee responses, it becomes evident that positive references significantly outnumber negative ones. According to the interviewees, they believe that making mistakes is a constructive means of learning and enhancing their language skills. They are optimistic that by committing errors, they gain valuable insights, which they can use to prevent repetition of these mistakes in the future. From their perspective, making mistakes is an inherent and normal aspect of the learning process that aids them in identifying areas that require improvement. In their statements, participants often mention that making mistakes is a natural part of the learning process, one that allows them to learn and improve. They also admit that making mistakes is a process that allows them to identify their learning issues and ensure that they will not repeat the same mistakes in the future. A couple of the participants made some very interesting comments regarding making mistakes: that learners should not be afraid of them, even if making mistakes put them out of their comfort zone while learning. After all, this could help them engage more actively with the language and develop their linguistic proficiency much faster.

At this point, it is worth noting that some participants with negative references in their responses may tend to downplay their mistakes in their eagerness to promptly convey their ideas and thoughts, while a few participants openly expressed a negative attitude toward making mistakes. More specifically, one participant admits that they prefer to keep on with communicating with another person, while they are aware of the occurrence of mistakes in their output, hoping that, eventually, the conveyed message will be understood. Another person admits that they are not aware of whether they are making mistakes or not; they also prefer to

maintain a good level of communication, hoping that it is effective. Finally, one participant made quite an interesting comment; they admit that they do not feel fine when they make mistakes, an emotion that contradicts previous comments about the benefits of “not being afraid of mistakes”, and a notion that could be further explored in another research project.

However, with error making, error correction is what naturally comes after. The questionnaires revealed that the participants feel quite happy with having their mistakes highlighted and their work corrected. A look on Table 4.32, also appearing in Chapter 4, shows that the participants maintain the same amount of consistency with the qualitative data that has been presented before, and reaffirm their positive stance regarding the correction of the mistakes they commit. Upon examination of the responses gathered and subsequently coded, the prevalence of responses exhibiting a degree of positivity substantially outweighs those with a degree of negativity. These responses, however, do not explicitly outline a certain means of correction for their mistakes. Some allude to the notion that it is the learners themselves who bear the responsibility for rectifying their errors, rather than relying on a tutor, while others refer to both self-correction and the involvement of their tutors in the correction process. The majority are resolute in acknowledging the value of having their mistakes corrected as a way to enhance their overall proficiency in English. Conversely, a minority with a negative perspective assert that error correction is not a top priority for them.

Just like before, the following table provides a clearer picture of the interviewees’ perception regarding the correction of mistakes in the learning process, adding more details that help understanding their viewpoints regarding error correction. Many of the participants recognise the importance of correcting the mistakes they make, because correction can lead to the overall improvement of the produced language. A learner admits that being able to correct their mistakes can help them to prevent repeating these mistakes in the future, a notion that

coincides with the concept of error making, as it has been previously established. The truth is that, for most of the participants, error correction is synonym to improvement and understanding of how the language world, a fact that is responsible for the emergence of the positivity in the participants' responses. Only two participants have expressed a negative point of view regarding the correction of the language mistakes, though they never attempted to further explain why they hold error correction in such regard. They feel that it is not necessary to correct every single mistake but decided not to elaborate further. This negativity could be explored in future research projects; for this project, though, the positive views regarding error correction seem to come in agreement with previous research and qualitative data and manage to further corroborate the findings.

All in all, after a thorough examination of the collected data pertaining to the second research question, it is possible to arrive at definitive conclusions and respond to it in a conclusive way. The participants, who serve as representatives of a broader cohort comprising adult Greek learners of English, undeniably acknowledge the existence of errors in their linguistic output. Furthermore, it is evident that they grasp the significance of error correction, regardless of whether this correction is carried out by themselves or others. Thus, the participants in this study exhibit a positive attitude towards both making mistakes in their written and spoken work, as well as having these errors identified and rectified, whether through the intervention of their instructors or self-correction.

The affirmative response in this research question has a very special significance to the nature of this research project. The fact that the participants are willing to having someone else highlight and correct their mistakes means that they are equally positive in having technology do this for them. After all, it was technology that was employed to help them notice mistakes they have made. AI chatbots were used to highlight some problematic areas in their written work and

direct their attention into successfully addressing these areas. The next item to be considered for investigation is the opinion of the participants regarding the effectiveness of technology in language learning. Before this, however, there is one more issue that needs to be addressed – the need for adult Greek learners of English to study English and use it at a high standard level, as well as the significance behind it.

5.4 Research Question 3: Why is it important for adult Greek learners to study English and reach a high standard level?

After an analysis of the specific types of errors made by adult Greek learners of English and an examination of their attitudes towards making and correcting mistakes, the next research question aims to investigate the underlying reasons for Greek learners to achieve a comprehensive mastery of English and to utilise it at an advanced level. This constitutes the natural progression in the project's development. Greek adult learners of English participate in language courses and undertake esteemed English language examinations for a multitude of motives, some of which have been identified in the existing literature and will be discussed in the forthcoming sections.

In order to answer this research question, the participants of the study were required to voice their opinions regarding the importance of producing English linguistic output at a high standard level – if possible, without mistakes, considering the variety of contexts in which English is used and any personal reasons to do so. As previously seen on Chapter 4, Table 4.20 has attempted to provide some useful insights regarding the high standard use of English from the participants, without making any errors or mistakes. When asked about the importance of producing error-free language, the participants provided some very interesting responses. Almost three out of four participants provided positive responses regarding the production of error-free language, with the rest of the participants suggesting that this is not one of their

priorities. While the participants were not asked to elaborate and explain the reasons why producing error-free language is important -or not-, their responses indicate that the majority of the participants do have at least one reason to use English without making any mistakes. Additionally, based on a hypothesis that this reason might be related to their work status or studies at an English-speaking environment/context, they were also asked to elaborate on their possible use of English at work, or during the studies. A look at the data appearing on Table 4.21 could potentially reveal the way the participants are using English at the above suggested contexts.

No matter the context, or the condition in which the participants have to use English, it is clear that the vast majority of them try their best to avoid making mistakes. Even if they do make mistakes, they will attempt to self-correct and ensure that communication with other parties is as clear and uneventful as possible. The rest of the participants, which comprise the minority of the participants pool, will acknowledge their mistakes and the fact that they will keep making them for the sake of uninterrupted communication. It is quite surprising that a very small percentage of the participants admits thinking into Greek and translating to English, despite being aware that their intended message might not be clear enough for the recipient. For these people, making mistakes is not an issue, and correcting these mistakes matters even less. A connection can be made with the findings of the previous table in the sense that the people who get to translate from Greek are those who do not intend to sacrifice communication, even if communication is impeded by translation-based mistakes and incorrect/improper structure.

The previous conclusions can be further confirmed through the interviews. At this moment, it should be reminded that less people were interviewed, compared to those who answered the questionnaires, so there is a slight possibility that the responses do not reflect the absolute truth. However, looking at the frequency of positive and negative answers, and

comparing them with the responses of the previous tables, there can be some reassurance regarding the validity of the collected data. The data that originates from Table 4.20, as can be found in the previous chapter, manages to reveal the attitudes of the participants regarding the use of English at a high standard level, while possibly avoiding making mistakes – or correcting them, when possible.

Throughout the interviews, there were seventeen positive references towards the importance of learning and using English at a higher standard, and only four references showing a negative outlook towards it. The majority of the participants, who have also provided a positive viewpoint towards the correct and high-standard use of language consider it important due to professional requirements. In order to provide some additional context regarding the participants' responses, it is necessary to mention specific examples regarding the necessity of using the language at the highest possible standard. A participant mentions his employment at a bank as a motivator for using the language at a very good level, due to the fact that he needs to communicate with clients and partners around the globe. Similar responses were collected from people working at the IT sector and the tourist industry. This final employment sector is quite interesting, as participants who are employed in booking agencies or are interpreters mention their direct contact with customers around the world, a fact that makes the necessity of using accurate and correct English more impactful in their professional life. Other participants, who are postgraduate students in foreign universities, suggest that using English in an error-free way is important for their studies and the requirements imposed by the different educational settings. Finally, there are also these participants who believe in the value of English as a *lingua franca* and suggest that speaking English in an accurate way could allow them to get closet to different cultures and nationalities, since the language barrier would be negated.

For these participants, the emergence of fossilisation can be quite an obstacle. Fossilised

patterns do not seem to be directly involved with their motivation to learn and master English as a foreign language. Fossilisation can affect their performance in certain employment and academic contexts, and they are afraid that their communication skills might not be able to reach the high standards of international communication and trade. Emerging mistakes in their output could cause undisputed difficulties, enough to strip them of their confidence and their willingness to engage in any form of communication using English (Roberts, 2020). On the other hand, the participants who do not consider this important are people who have learnt English as a necessary skill, though their life and their employment status does not require them to attempt and use English at a very high level (Manirakiza et. al, 2021). These few participants are employed in the Greek public sector and do not need to use English for their daily communication needs. What was interesting from these responses is that all of them suggest that English does not play any role in their professional and personal life, yet they do not disclose any situations where English would indeed be useful to them. A future approach to the findings of this study would ask the participants to provide examples of possible uses of the language, so that certain contexts of English language use could be established, and the necessity of using the language as error-free as possible could be further enhanced.

Relevant studies seem to further confirm the significance of English proficiency among Greek learners, and the reasons why Greek learners attempt to achieve it. Firstly, English holds a global status as the language of communication, commerce, and technology, making proficiency in English vital for international business opportunities, travel, and academic engagement (Calderon et al., 2011). Secondly, within the educational context, research underscores the role of instruction quality as a crucial factor for English learners (Calderon et al., 2011). Attaining a high level of proficiency in English allows Greek learners to actively participate in educational environments where English serves as the primary medium of instruction. This enables them to access higher education programs, engage in research, and partake in academic discussions

(Callahan, 2005).

It should also be noted that English proficiency is essential for Greek learners in the professional world. Many multinational companies require employees to have a good command of English, especially in fields such as tourism, hospitality, and international business (Calderon et al., 2011). By attaining a high standard level in English, Greek learners can enhance their employability and career prospects. In addition, learning English and using the language at a high standard level is important for Greek learners in terms of practicality and usefulness. In a study on teaching Greek as a second language to adults of refugee and immigrant backgrounds, learners expressed positive feelings and found the lessons to be practical and pleasant (Kekia, 2022). By learning the Greek language, immigrants are able to thrive in a foreign setting, thus steadily improving their standard of life. Similarly, learning English can provide Greek learners with the ability to communicate with a wider range of people, both within Greece and internationally. It can also open up opportunities for employment and further education, as English is widely used in these contexts (Alotaibi, 2020).

Moreover, English is also important for Greek learners in the context of technology and digital literacy. Calderon et al. (2011) maintain that the Internet is predominantly accessed in English, and proficiency in English enables Greek learners to access a vast amount of information, resources, and opportunities available online. Additionally, English proficiency is crucial for engaging with digital platforms, social media, and online communication tools that are predominantly in English. And while the next reason does not apply to a large base of adult Greek learners of English, there is research which suggests that English language learning through extracurricular activities, such as gaming, can contribute to language proficiency among young learners (Sylvén & Sundqvist, 2012). Engaging in activities that involve active reading, active listening, and vocabulary acquisition in English can enhance Greek learners' language

skills and overall proficiency. It should also be stressed that English is widely recognised as a lingua franca, and understanding different varieties of English is essential for effective communication in global contexts (Jenkins, 2006). Learning about these different varieties of English, their similarities and differences, and issues related to intelligibility and identity is crucial for Greek individuals to engage in international interactions and succeed in various domains.

Furthermore, another compelling reason underscores the necessity for Greeks to master and proficiently employ the English language. With many Greeks having migrated to foreign countries, such as Australia, the United States, Canada, or the United Kingdom, several generations ago, it is now expected that their descendants predominantly use English as their primary language for communication. As a result, learning and effectively using English is crucial for Greeks who wish to connect with family members living in these diaspora communities (Fanany & Avgoulas, 2019). Interacting with English-speaking Greek diaspora communities in various countries necessitates a high level of English proficiency to help these individuals maintain their cultural identity, strengthen their familial bonds, and engage in social and professional networks in Greece. This cross-cultural communication, facilitated by English proficiency, plays a significant role in the maintenance of cultural connections and heritage.

Ultimately, it would be safe to admit that all the information coming from the participants' responses during the interviews verifies that of the questionnaires, as well as with the existing literature. Therefore, it is also safe to assume that there is a significant number of reasons and motivators that urge adult Greek learners and users of English to learn and use the language at a very high standard. While the reasons mentioned above do not relate and apply to all the Greek learners out there, they are indicative of the factors that lead towards the correct and high-level use of the English language in different aspects of life. However, it is because of these reasons

that fossilisation can be a hurdle in obtaining

5.5 Research Question 4: How effective is the application of computer-assisted and mobile-assisted language learning, including AI apps in correcting advanced adult Greek learners' grammar and lexis errors?

All the previous research questions have been leading to this final question. It has been established that Greek learners have many reasons to learn and use the English language in a correct and effective way, and at a high standard. In order to achieve this, they need to ensure that the language they get to produce is as error-free as possible. If there are any occurring mistakes and issues with their linguistic output, the data collected for the purposes of the study has shown a general openness to making mistakes and addressing them quickly and efficiently, either by themselves, or with the assistance of a tutor and/or other means.

This study has been focusing on the use of technology. More specifically, it has been designed utilising computer technology for primary work and communication, as well as a combination of computer-assisted and mobile-assisted applications that run under the artificial intelligence umbrella. The study had been fulfilled on the basis that technology in general, and artificial intelligence chatbots in particular, could be effective in improving the outcomes of teaching, and could possibly result in a reduction in the number of mistakes made by advanced learners of English, mistakes that are attributed to Second Language Acquisition issues, like fossilisation. An extensive presentation of relative literature regarding the application of various forms of technology in educational contexts, along with the advantages and disadvantages this entails, has been made in the second chapter. However, since this particular study involves the use of AI chatbots in language learning, discussing some of the benefits and drawbacks of working with this form of technology seems more relevant and beneficial for the development of the study, before proceeding to the findings.

The next step involves the investigation of the different aspects of the collected data that are relevant to this research question. A first start can be done with the examination of the statistical data appearing in Table 4.3 up to Table 4.14. In these tables, the point that needs to focus on is the mean scores, which refer to the proportion of correct language use before and after the moment the chatbot indicated an incorrect language use. Results showed that the proportion of correct usage of the target structure significantly increased after the chatbot corrected the learner errors through recasts. The increase in the mean scores suggests that most of the participants have been positively affected by the intervention of the artificial intelligence in their work, which resulted in the production of more accurate linguistic output. The majority of the sessions are also statistically significant, with very few exceptions, which can be attributed to a variety of reasons. One possibility is the low level of difficulty in some areas, despite being mentioned in the literature as “challenging” for Greek learners. Another indication that could justify the statistical insignificance and the relative high mean scores is that some sessions include items for which the learners are in danger of fossilising. A good example of this would be the session with the phrasal verbs, which is the session with the lowest statistical insignificance. In this case, the learners have a declarative knowledge of their form (verb and preposition), but might struggle with the accurate use of the phenomenon, especially after considering that some of the phrasal verbs they were introduced to could have been new for the participants.

Looking at the responses of the participants, both in the questionnaires and the interviews, it can be easily observed that the participants hold a positive view regarding the use of technology in the learning process, and the positive outcomes regarding error production. The information of the tables that appeared in the previous chapter can attest to the overall effectiveness of technology and the AI tools that were used during the study. As a reminder, the

participants had to give their opinion regarding **the effectiveness of the use of technology in the teaching process, the effectiveness of the artificial intelligence tools that were used in the study, and their perception when it comes to the application of artificial intelligence-enhanced tools in education.** One additional question required them to answer whether they found the forms of technology they used during the study comfortable and easy to use, or whether the use of these tools was a challenge to them. The findings of the data from the questionnaires are more than clear regarding these two areas. More specifically, Tables 4.22 and 4.23 appear to suggest that they recognise the importance of the role technology gets to play in the learning session, while at the same time they believe that using this technology did not cause a significant challenge to them. The vast majority of the participants admitted that technology plays an effective and positive role during the learning process, a fact that is also confirmed by a significant number of studies in the literature. A look at the studies mentioned in 2.3.3 regarding the use of technology in task-based learning could also assist in understanding why the participants of the study feel positive towards the use of technology in the learning process. In addition, the participants also believed that the technology that was used, including the artificial intelligence applications and the application used for the delivery of the sessions, did not cause them a significant difficulty that would not allow them to fully participate in the study. Therefore, the participants have expressed a sense of familiarity with all the tools that were used throughout the study, one that enabled them to continue with the study as expected. This is possible due to the digital literacies that they have developed through their day-to-day use of technology, for employment and personal reasons.

However, the inclusion of an artificial intelligence chatbot was definitely a new type of technology that they were exposed to, one that was completely different from everything they have been working with during (and beyond) the study. As a result, a point raises regarding the effectiveness of the role artificial intelligence is asked to play, both in improving the learners'

overall learning experience, as well as in the educational context in general. Tables 4.24 and 4.25 provide a clear overview of this point from the participants' perspective regarding the level of the artificial intelligence's efficiency and its future in education. According to these, the participants have agreed that the use of technology has its own merits; it is easy to use, and it assists in improving the quality of instruction and the overall learning process. The participants, however, also seem to agree that the use of artificial intelligence in their own learning experience during the study has been significantly effective as well. They feel quite positive with their experience working with the artificial intelligence chatbot they chose, and they believe that, in the future, artificial intelligence will be an integral part of education, and will transform the learning experience of more and more people around the globe. Also, going back to the literature review and the methodology, it is evident that the participants have been assisted through the corrective feedback provided by the chatbot. This was, after all, the betting point of the study, even if this was not communicated to the participants explicitly and directly.

This statement is also reaffirmed with the data collected from the interviews. The previous chapter provided the opportunity to look at the frequency figures of the participants regarding their perception towards artificial intelligence as a form of technology, and as an effective learning tool, which makes it a positive and useful aspect of the learning process. It was previously mentioned that the interviewed participants also seem to hold a favourable view towards the use of artificial intelligence. However, as it has already been stressed, their responses seem to slightly diverge from the responses that were collected from the questionnaires. Tables 4.29 and 4.30 were able to establish a positive attitude towards AI as a form of technology, but also revealed some scepticism regarding the use on AI as part of the educational process. While it should come as no surprise that the participants manage to maintain a positive outlook of artificial intelligence, even a year after the questionnaires, it is interesting to observe that the gap between the participants who are positive towards the use of

artificial intelligence as part of the educational process has been greatly reduced. It is worth to mention that this alteration between the two data collection methods is centred on participants' attitudes regarding the human element. They assert that while AI tools exhibit effectiveness and potential, the role of humans within the educational realm, as active facilitators and supporters of the learning process, should not be relegated.

According to the data collected from the interviews, the perspectives on the utilisation of Artificial Intelligence (AI) for language learning are multifaceted, reflecting a range of opinions among individuals. Some contributors express their positive views unconditionally, noting that AI has significantly aided them in enhancing both written and spoken English. They describe the experience as enjoyable and commend the AI chatbot for its helpfulness. This point of view also confirms the outcomes of studies mentioned in Sections 2.3.2 and 2.3.3, in particular, of the Literature review chapter. A good example is the study made by Harry (2023), which suggests that AI can assist learners due to its ability to analyse the performance of the user and make the overall experience more personalised. Jawid (2023) also seems to have reached similar outcomes, attributing the effectiveness of the AI to the power of the algorithms that understand faster the areas of strong performance and the more challenging areas that require attention.

Other participants, according to the interviews data, adopt a more balanced stance, recognising the advantages of AI while emphasising the need for balance. This perspective highlights the importance of maintaining a balance between AI-assisted language learning and human interaction. There is a prevalent feeling that AI should serve as a supplementary tool rather than a complete replacement for human teachers. Individuals in this category acknowledge the potential of AI to augment convenience, speed, and creativity but advocate for its ethical and responsible use. Conversely, a few other participants express a more cautious or sceptical viewpoint, voicing reservations about relying extensively on AI in various aspects of daily life. Concerns are raised regarding the potential impact on employment for humans, emphasising the

need for careful consideration and scrutiny in integrating AI technologies. Finally, there are those who express a clear preference for human interaction over technological interventions. Despite an acknowledgment of the benefits of technology in the classroom, some individuals confess to not being avid supporters of AI, highlighting a personal preference for authentic conversations with fellow human beings.

Generally speaking, it is evident that the participants understand the effectiveness of artificial intelligence when it comes to improving their language skills. They suggest that there are many benefits in using artificial intelligence technology not only in language learning, but other aspects of everyday life as well. The fact that artificial technology is easy to operate and delivers results at a high speed, makes it a valuable tool, according to the participants. While the participants did not engage in assessed oral practice during the study, they still believe that their interaction with the artificial intelligence chatbot was more than adequate in helping them maintain a high standard level of the language and get the feeling that they have improved their linguistic proficiency in both written and spoken English. Despite the positive references though, there are also those participants who voice the necessity of a human facilitator between the learners and the artificial intelligence chatbot. Contrary to the questionnaires and the more positive acceptance of the artificial intelligence chatbots, the interviewees keep stressing the fact that artificial intelligence should operate as a supplementary tool, rather than a technology that is here to diminish the necessity of the human factor. This trend in the responses of the interviewees becomes even more evident when they were asked about their opinion regarding the place of artificial intelligence in education.

According to the interviews data, the participants generally express positive points, acknowledging the helpfulness of chatbots in language learning. It should be noted that, while the study depends on the concept of corrective feedback through chatbot recasts, the participants

were not informed that this is the intended purpose of using AI chatbots for the duration of the study. Therefore, it is quite encouraging that the participants were able to appreciate the role of the AI chatbots when used to improve their overall linguistic competence. This positive influence is also supported by a few relevant studies, most of which appear in Section 2.3.4. A good study that can be used as an example would be Huang et. al. (2021), which talks about improving the learners' interaction. Another study by Chen et. al. (2020) brings forwards the importance of the improvement of engagement and motivation in learning. Despite this, they underscore the importance of human interaction with a teacher, asserting a preference for the personal touch that only a human instructor can provide.

Some participants offer a balanced perspective, believing that chatbots can be powerful tools in the classroom when used in conjunction with teachers. There is a consensus that while chatbots can transform language learning, they cannot entirely replace the intrinsic value of real conversations and the guidance provided by human teachers. Recommendations are made for AI technologies as supplementary tools to augment the learning experience alongside human interaction. In contrast, certain participants express reservations and skepticism. They underline the limitations of chatbots, highlighting the absence of cultural understanding and sensitivity when compared to human teachers. Concerns are raised about the inability of chatbots to provide sufficient encouragement, guidance, and support, reinforcing the irreplaceable role of human instructors. It is interesting to see that, apart from the concept of understanding and sensitivity, the participants do not mention other disadvantages like those that appear in Section 2.3.4 of the Literature Review chapter. For instance, they do not seem to identify any lack of authenticity of the communication context established between the users and the AI chatbots (Fryer et. al., 2017), or a potential decrease in interest, according to Winkler & Söllner (2018). Therefore, the points gathered in these interviews could possibly add to the existing knowledge of the drawbacks of AI chatbot use, which poses an interesting research concept for the future.

Other participants offer a mixed view, acknowledging the potential usefulness of AI chatbots but noting a lack of significant personal impact on their language skills. Nevertheless, they end up accepting that such tools might benefit others in their language learning journey. In addition, there is also a belief that AI chatbots have the potential to be a game-changer in language learning, providing instant and personalised practice opportunities. However, this optimism is often coupled with a cautious approach, recognising the need for a balanced combination of AI and human interaction for an optimal learning experience. Furthermore, the importance of human interaction is consistently emphasised. Participants stress the crucial role of teachers in providing guidance, motivation, and a personalised learning experience. The consensus is that while chatbots can be valuable resources, they should not replace human interaction and expertise. The recommendation is to use AI technologies as supplements rather than replacements in the educational landscape.

Generally speaking, the participants have clearly expressed their opinion regarding the close association of artificial intelligence and the various educational settings these can be used. Just like before, some of the interviewees keep stressing the benefits of using this type of technology and how it can be used to enhance the learning experience of the users. Despite the benefits of artificial intelligence, however, they seem to be more reluctant while considering the human factor. Most of the interviewees agree that artificial technology should not disregard the human factor. When it comes to education and learning, where teachers and instructors are an irreplaceable asset, artificial intelligence is only a type of technology. It is valuable and useful, but it is also incapable of displaying all these human properties that allow teachers and instructors to connect and inspire their learners.

To conclude, and in order to provide an answer to the fourth research question, the

general consensus from both the questionnaires and the interviews is more than positive. However, it is interesting to see that a higher number of participants has developed some scepticism over the more expansive use of artificial intelligence. It is quite possible that the one-year gap between the questionnaires and the interviews has been crucial and defining in shaping the public opinion regarding artificial intelligence and its uses. The development of generative artificial intelligence chatbots, such as Chat GTP, along with the variety of opinions that are against it, due to the unethical and employment-threatening applications of this technology have possibly affected some of the participants' responses. And while this difference in opinion is worthy of further investigation and research, the fact remains that the current data manages to satisfactorily answer the fourth research question. Artificial intelligence applications, along with the more traditional forms of technology can be an effective asset in education, and language learning. And considering the ability of the AI chatbots to use accurate language and help learners notice and use forms of accurate language as recast mechanisms, suggesting that they can effectively assist learners overcome fossilisation cannot be an exaggeration. While the participants of the study comprise a small part of the total pool of learners around Greece and the world, it can be safe to assume that participants are in favour of the use of technology and the use of artificial intelligence. It should be noted, however, that there must be certain boundaries between technology and the human factor. These boundaries will ensure that instruction and learning can be further enhanced, in a way that is more beneficial to learners, while reaffirming the role of humans and technology in the learning environment.

Chapter 6: Conclusion

6.1 Introduction to the chapter

The final chapter of the thesis attempts to play two distinct roles; to reflect on the topics and the issues that have been explored throughout the thesis, and to set the foundations for future and potential research.

This research project has explored the role that technology plays in the learning of English for advanced Greek learners, and specifically the application of AI chatbots as a means of attenuating -or even completely- preventing fossilisation in their linguistic output. It attempted to test the ability of advanced learners of English to treat any fossilised, incorrect patterns that emerge in their written English, when they are exposed to accurate language by a chatbot.

There are two reasons why advanced Greek learners were selected for this research project. One reason is because this group of participants is not expected to make as many mistakes and errors as beginner and intermediate learners but can still be prone to making mistakes due to fossilised, persistent patterns in their output that have not been treated before. Another important reason is due to the position learning English, and speaking proper English holds in the Greek educational context.

Learning English is important in Greece for several reasons. First of all, English language learning is highly valued in Greek education and is seen as essential for preparing young Greeks for the future (Rothoni, 2017). The emphasis on English language learning is also influenced by the increasing importance of ICT literacies, which are often taught in English (Rothoni, 2017). Therefore, learning English in Greece is not only about language proficiency

but also about acquiring the necessary skills for the digital age. Secondly, learning English in Greece can contribute to raising cultural awareness (Koika, 2015). Traditional score and certificate-oriented teaching of English in Greece often focuses on drilling the skills that are examined, such as listening, speaking, reading, and writing (Koika, 2015). However, there is a need to cultivate a cultural consciousness that would make the teaching and learning of English more entertaining and effective (Koika, 2015). By learning English, Greek learners can gain a deeper understanding of different cultures and perspectives.

Furthermore, the interplay between the global and the local in English language learning is significant in Greece (Mitsikopoulou, 2007). In that same study, Mitsikopoulou claims that English is a global language, and its influence can be seen in various aspects of Greek society, including education and electronic communication. Learning English allows Greek learners to navigate the globalised world and engage in international communication and financial operations. In addition, learning English is important for specific groups in Greece, such as Muslim adult learners attending Second Chance Schools (Kazantzi & Zafiri, 2019). These learners aim to learn English as a foreign language to enhance their educational and employment opportunities. English proficiency can open doors to higher education and better job prospects for these individuals. Lastly, the development of employability skills is emerging as an important aspect of higher education in Greece, according to Asonitou (2015). English language proficiency is often considered a crucial employability skill in the Greek workforce (Asonitou, 2015). By learning English, Greek graduates can enhance their employability rates and increase their chances of success in the job market.

The situation in Greece regarding learning English is also influenced by various factors. One study conducted in Greece examined the use of web-enhanced teaching of English as a foreign language in higher education (Dogoriti et al., 2014). The study found that students had

positive perceptions of online instruction using a learning management system (LMS) and Facebook as an adjunctive learning platform. This suggests that technology can play a role in enhancing English language learning in Greece, a concept that was also supported and confirmed by the findings of this study. Another study confirmed that English is the second language for participants in Greece, both in terms of proficiency and order of acquisition (Dimitropoulou et al., 2011). The participants were exposed to English within the context of the British Council. This highlights the importance of English language education institutions, such as the British Council, in providing opportunities for language learning in Greece.

This piece of information also comes to connect with information that appeared in the first chapter of the thesis, which demonstrates the prominent role the various educational institutions play regarding the teaching of the English language to Greek students. However, it should be noted that the dominance of English as a global language poses challenges for language learning in Greece (Busse & Walter, 2013). The increasing prominence of English makes it difficult for educational institutions to attract students to study languages other than English. This suggests that there is a need to address the motivation and incentives for learning languages other than English in Greece. Additionally, the impact of English as a global language on educational policies and practices in Greece needs to be studied (Nunan, 2003). This includes examining the effect of English on first and indigenous language development and understanding the extent to which access to English determines economic advancement. This highlights the broader sociocultural implications of English language learning in Greece.

Finally, this study briefly touched upon the perceptions of Greek learners of English regarding the mistakes they produce. However, in terms of English proficiency levels and attitudes in general, there is a connection between proficiency and student attitudes in Greece. This suggests that attitudes towards English may be influenced by language proficiency, and

efforts to improve English language education in Greece should consider both language skills and attitudes towards the language.

After considering the overall context of learning English by Greek learners of English, the participants that were enrolled in the study attended thirteen sessions, in which they were exposed to certain grammar phenomena, had the opportunity to practice them in both classwork and homework tasks, and also engaged in certain tasks with AI chatbots, which required the use of the phenomenon they were exposed to. The findings of the study could be multi-faceted and pave the way for additional research projects. They could further enforce the results of studies that focus on the involvement of technology in the learning process, and they can certainly influence the dynamics of artificial intelligence technology in a learning environment. More importantly, though, they can provide third parties, such as publishing houses, a new alternative that can be used to address issues in the learning process that are caused by persistent language acquisition phenomena, such as fossilisation. With new tasks that can be created based on the use of AI technologies, and the offering of additional, new opportunities for practice, the findings of this study can prove to be an asset to the learning and performance targets for a variety of learners, both inside and outside the borders of Greece.

6.2 The aims and findings of the study

The study aimed to answer the following questions:

RQ 1 - What are the written grammatical errors advanced Greek learners of English produce?

RQ 2 - What is the learners' perception regarding producing and correcting written grammatical errors of English?

RQ 3 - Why is it important for adult Greek learners to study English and reach a high standard level?

RQ4 – How effective is the application of computer-assisted and mobile-assisted language learning, including AI apps in correcting advanced adult Greek learners' grammar errors?

The findings of the first research question are the ones that enforce the study's theoretical contributions. The study sought to uncover the prevalent mistakes and errors made by the group of learners that participated in the study, shedding light on the complexities they encountered during their linguistic competence journey, especially those that might be attributed to SLA issues. More importantly, though, the first research question attempted to provide a link with existing literature, one that could provide more insight regarding the nature of issues that challenge adult Greek learners of English, instead of younger learners.

The study found that existing literature primarily focuses on grammar and phonology as the main areas where Greek learners tend to make mistakes. The link between Greek orthography and phonetic pronunciation leads to spelling errors, while differences in phonological patterns pose challenges in adapting to English pronunciation. Beyond these phonological considerations, specific grammatical areas, such as conditionals, passive voice, modal verbs, and word order, present significant difficulties for Greek learners of English. The research also highlighted a shortage of comprehensive insights into the typology of errors made by Greek learners, emphasising the need for further investigations to enrich our understanding of these challenges. The study categorised these areas into various linguistic dimensions, guiding the development of instructional materials used in the research.

Moreover, this research uncovered a notable gap in the existing literature, as it mainly focuses on younger English language learners, neglecting the specific challenges faced by adult Greek learners. By considering the findings, this study aims to serve as a cornerstone for constructing a comprehensive database on the difficulties encountered by adult Greek learners during their

language acquisition journey. It also acknowledges the potential need for further research involving a broader participant pool to gain a more comprehensive understanding.

Moving to the second research question, the focus here was on the significance of rectifying language mistakes, as well as the examination of the participants' perspectives on making and correcting language mistakes, highlighting the importance of error identification and correction in the language learning process.

The research found that correcting language mistakes holds significant importance for several reasons. First of all, corrective feedback contributes to language skills enhancement, facilitating learning and improvement. Mistakes also serve as valuable markers, guiding learners in identifying areas requiring improvement and enhancing self-awareness, especially in writing tasks. Moreover, error correction is vital for effective communication, ensuring clarity and comprehensibility. It provides insights into the language acquisition process, helping educators refine their instructional strategies and develop enhanced educational materials.

The study also revealed that participants are well-acquainted with the concepts of identifying and self-correcting errors. While some variations exist in their practices, a generally strong command of the language and a constructive disposition toward improving linguistic proficiency are evident. It is also evident that the participants display a positive attitude toward making and correcting mistakes in both written and spoken language, whether through self-correction or external intervention. This positive response aligns with the use of technology, such as AI chatbots, to highlight and correct language mistakes, highlighting the potential effectiveness of technological tools in language learning.

The findings regarding the second research question underline the importance of error

correction in the language learning process, highlighting the need for tailored pedagogical approaches and the incorporation of technology to support adult Greek learners of English in achieving high proficiency levels. This positive attitude toward making and correcting mistakes in language learning bodes well for the integration of technology and innovative approaches in language education.

Next, the third research question of the study delved into the underlying reasons motivating adult Greek learners of English to achieve comprehensive mastery and utilise the language at an advanced level. The investigation identified multifaceted motivations derived from literature and participant responses.

English proficiency among Greek learners is deemed crucial for international business opportunities, travel, and academic engagement, given English's global status. Proficiency facilitates active participation in educational environments and access to higher education programs conducted in English. Additionally, English proficiency enhances employability in multinational companies, particularly in fields such as tourism and international business. The practicality and usefulness of English are emphasised, enabling learners to thrive in foreign settings and communicate with a broader audience. Proficiency in English is vital for digital literacy, providing access to online information and opportunities. The recognition of English as a lingua franca underscores the importance of understanding different varieties of English for effective global communication.

The findings regarding the third research question also highlighted the significance of English proficiency for Greeks with family members in diaspora communities, fostering cross-cultural communication, and maintaining cultural connections. Participants expressed positive attitudes toward producing error-free language, with professional requirements, international

communication, and personal reasons driving their commitment to high-standard language use. The majority of participants across various contexts, including work and studies, demonstrated a strong desire to avoid mistakes in their English communication. Even when mistakes occurred, participants showed a proactive approach to self-correction to ensure clear and effective communication. Some participants, albeit a minority, acknowledged thinking in Greek and translating to English, indicating a potential impact on communication clarity. Interview responses further affirmed the importance of learning and using English at a high standard, with the majority citing professional requirements, international communication, and personal motivations. The findings align with existing literature and provide insights into the diverse factors motivating adult Greek learners to pursue advanced proficiency in English.

For the purposes of the fourth research question, the study aimed to explore the motivations and attitudes of adult Greek learners of English regarding the use of technology, specifically AI chatbots, as a means to enhance language learning outcomes. The study attempted to introduce AI chatbots into the language learning process and assess their impact on participants' linguistic accuracy.

Statistical analyses, including paired t-tests, demonstrated a positive influence of AI chatbot interventions on participants' linguistic accuracy, as reflected in higher mean scores after the interventions. Participants' responses from questionnaires and interviews further emphasised their positive views on the effectiveness of technology, including AI tools, in the learning process. The majority of the participants found these tools easy to use and acknowledged their contribution to improved language skills. While participants generally embraced AI technology, interviews revealed a nuanced perspective, with some expressing the importance of retaining the human element in education. Participants recognised AI as a valuable supplementary tool but stressed the irreplaceable role of human instructors in facilitating learning. There was a shift in

attitude over time, with some participants expressing scepticism about the broader use of AI in education, possibly influenced by developments in generative AI chatbots and ethical concerns. The findings related to the third and fourth research questions also comprise the methodological and pedagogical contributions of the study. AI chatbots were used as a language practice tool over a course of different discussion topics. The engagement of the study participants with the chatbots allowed them not only to practice the language but notice and avoid repeating mistakes attributed to fossilised language patterns through their exposure to recasts. The use of AI technology throughout the study suggests that it can be used more extensively in the learning process. The study used them as a recasts tool, considering their ability to provide corrective feedback to adult learners of English. Of course, it is up to the teachers and the material designers to provide more opportunities to the learners, in order for them to interact with AI technologies over a variety of learning topics and contexts. By considering the wide availability of AI chatbots as a form of language practice and their use as a tool that enhances learning autonomy, they could establish more opportunities to introduce them to the learning process more frequently and extensively.

So far, the research questions have been successfully addressed, having been backed by both existing literature and the findings of the study. However, despite the positive developments, there were some difficulties that could have altered the overall development of the study and could have led to different discoveries altogether. The next section presents the limitations of this study which occurred in the research setting, regarding the conduct of the study and the data collection methods.

6.3 Limitations of the study.

Although a researcher can carefully design and conduct a study to the best of their

abilities, limitations can occur in any kind of research (Creswell, 2013). This study is limited to adult Greek learners of English as a foreign language, including the design of the tasks that were used, and the participants who volunteered to take part in it. Therefore, the results of this exploratory study may not be generalised to larger populations of other nationalities and learning backgrounds.

The researcher's previous experience with adult Greek EFL learners might have influenced the proceedings of the study. This includes the understanding of the challenges they are dealing with, their strengths and weaknesses when it comes to language learning and practice, as well as personal attitudes towards using technology in the learning context. Because of that, the selection of the materials and their sources has been made based on that prior experience. However, the fact that the study was conducted in an entirely different manner (remote teaching) could have meant that different materials could have been used and other classroom practices could have been employed. These are discussed in the methodological limitations in more detail, along with other limitations that occurred in the research context, and the participants themselves.

6.3.1 Research context

Firstly, this study used video recording while the sessions took place on Microsoft Teams. With the recorded sessions being stored online, it was easy to conduct some kind of observation while the participants were working on the AI task in the second weekly session. However, some participants wished to not show on camera, to protect their identities. Therefore, while the AI tasks were sent in that session, it was impossible to fully comprehend the way all the participants were working with their chosen AI chatbot.

An important aspect of the study that could also be a disadvantage is the fact that none of

the sessions took place face-to-face. With COVID-19 restrictions being in place, and with trial sessions and some of the sessions of the first group having taken place during the isolation period, it was impossible to fully gauge the participants' performance. It is possible that in a face-to-face session, the participants could have managed to perform in a different way. Sometimes, the Hawthorne Effect occurs in observation, according to which the subjects of observation may behave differently in front of an observer than they normally do on their own (Mackey & Gass, 2011). This means that the results collected from the work that has been submitted could have been different if that work was done and collected at the end of a session that took place in a real-life learning environment.

Finally, the study was only focused on written English. While most of the four English language skills were utilised during the sessions, the truth remains that the collected work involves only written English. While existing literature also confirms that Greek learners of English are having issues with their phonology, there was no opportunity to involve tasks that could check whether the phonology of participants is involved. This is due to a lack of time and funding that could have permitted the purchase of premium subscriptions, which enable the oral communication of the user with the chatbot. An investigation of the oral performance of the participants could have provided additional data that could have further evaluated the overall performance of the participants with the AI chatbot assistance.

6.3.2 Participants

Since the study took place with the assistance of adult Greek learners, its findings are limited only to adult learners of Greek nationality. Chinese and Arab nationals were also considered to be included in the study, though this would take more resources and much more time. Therefore, it was decided to focus only on the Greek learners of English and undertake research with other nationalities some other time, and during another research project.

While effort was made to ensure that all of the participants had been advanced users of English, the level of a few of the participants had significantly dropped since the year they acquired their C1 or C2-level certificate. This was obvious in their performance at the written tasks, and because they tended to make more mistakes in the AI task. While their performance tended to improve, if these students had not been enrolled in the study, it is possible that some of the findings would have been much more different.

6.3.3 Methodology

This study used written tasks, questionnaires and interviews to gauge the performance of the participants and to gauge their improvement in the AI task. However, given that the expected levels of the participants were C1 and higher, none of the materials and the tasks were delivered in the participants' native language. As a result, some weaker participants often felt confused at the beginning, and some of them almost threatened to abandon the study – which, fortunately, did not occur.

This study did not employ a delayed test that could have been of significance to the collected data and the findings because it was difficult to assemble all the participants after they finished the last module of their course. This was true considering that the interviews, which took place months after the final session of the second group, were not attended by all the participants. Also, as was mentioned previously, the data collection tools were designed to investigate the performance of the AI chatbots regarding the correction of mistakes that were made after the instruction, as well as the perceptions of the participants regarding these mistakes and the use of the English language at a high standard. They were not able to show any improvements regarding the learners' phonology – and despite the fact that the teaching sessions are recorded, these are not supposed to be used in this study, as phonology and spoken English, in general, are not the focus of the study. However, this inspired a potential research idea and

will be discussed later in this chapter.

6.4 Implications

Exploiting the potential of AI chatbots and other generative AI applications can be of benefit to EFL instructors and teachers in classrooms. After all, existing literature confirms that tasks designed using this form of technology can offer students new ways of engagement, and access to practice materials anytime, anywhere. For the purposes of this study, the participants felt comfortable engaging with their selected AI chatbot and managed to complete their tasks within the allocated time, a fact that shows an overall good level of engagement with a relatively new technology. There are, however, some things that must be taken under consideration before fully applying AI-related technology in a variety of educational settings.

This present study's major implication points to the beneficial effects of AI chatbot use by demonstrating their ability to reduce errors prone to fossilisation in advanced learners of English. They acknowledge the overall advantages of using AI and maintain that AI can now be used to further perfect their language output by making less mistakes. This is important because a new benefit can be introduced in the literature, while at the same time it can be tested with adult English learners of other nationalities. One aspect that has been touched by the participants is the fear regarding the human factor. A number of them have suggested that AI could diminish the human factor and be responsible for the loss of many jobs. The findings of the study, however, could suggest that this statement is not really true. The impact of AI on the roles of teachers and students has been analysed in relevant studies, indicating that AI cannot completely substitute human teachers (Jian et al., 2021). Because of this, it is important to note that understanding teachers' attitudes and perceptions around AI education is crucial, as teachers play a key role in bringing innovation to the classroom and developing innovative educational paths (Polak et al., 2022). Incorporating AI and machine learning tools into online classrooms can

address challenges faced by teachers, such as curriculum planning and administrative work, and loss of personalised interaction with students (Yildirim et al., 2021). This highlights the potential benefits of AI in alleviating some of the burdens faced by teachers, a fact that should be made explicitly clear to teachers and reassure them about the efficiency of the use of technology in their work.

The teachers should also remember that it is important to provide opportunities for autonomous learning to their students. After all, teachers who are autonomy-supportive have a more positive impact on students' intrinsic motivation than teachers who are controlling (Deci & Ryan, 1985). AI tools and applications can provide an excellent opportunity for autonomous work, both inside and outside the classroom. By using Replika and Kuki, teachers are able to design and assign tasks that can be more engaging and far more different to the traditional format of activities that are introduced in coursebooks. While these applications support mainly conversations and interactions, the teachers can find ways to use samples of their students' submitted work for pair and group work, or for feedback that focuses on specific aspects of the taught language. Since the teachers will be the ones who process their students' scripts, they will be able to ensure anonymity, while they provide a more interesting and possibly more challenging means of engagement to their students.

Implications from this study could also extend to EFL book writers and publishers. EFL book publishers can indeed utilise AI chatbots to enhance their books and support language learning. The potential of chatbots in education, particularly in large-scale learning scenarios, has been recognised, as they can provide individual student support, addressing the need for personalised learning, according to existing literature (e.g., Winkler & Söllner, 2018). However, there is a lack of knowledge regarding the factors that affect users' trust in chatbots, which is an important consideration for their successful implementation (Følstad et al., 2018). Also, research

has shown that chatbots can encourage students' social presence through affective and coherent communication, potentially improving their language learning experience (Huang et al., 2021). Additionally, the use of AI chatbots in EFL settings has been found to help develop students' language skills and structures, indicating their potential pedagogical implications (Klimova & Seraj, 2023), a trait that is visible in the present study. Furthermore, the integration of AI chatbots into EFL speaking classes has been shown to improve students' understanding of course material and enhance their speaking skills (Neo, 2022).

Moreover, the use of AI chatbots in language learning has been associated with potential benefits such as reducing speech-related anxieties and learning inhibitions, which can be particularly relevant for EFL learners (Bao, 2019). Also, the integration of chatbots in EFL learning has been proposed as an alternative solution, highlighting the potential for chatbots to enhance the overall learning experience (Wahyuni, 2022). These are facts that can be utilised by EFL publishing houses while working on new coursebooks and other supplementary materials to be used in an EFL classroom.

An additional implication of the study and the effectiveness of the AI-related technologies should address EFL curriculum designers. While designing a curriculum, the selection of the learning materials should focus on the quality of the curriculum, rather than the quantity (Al-Nasser, 2015). Curriculum designers can consider AI chatbots as valuable tools for enhancing the learning experience. Obviously, it is important for them to consider the potential drawbacks and limitations of AI chatbots, such as inaccurate content generation and the need for continual one-on-one support, to ensure that the integration of chatbots aligns with the overall educational goals and objectives (Gallacher et al., 2018). They should also bear in mind that addressing factors impacting user acceptance and optimizing user experience is crucial for the successful utilisation of AI chatbots in educational settings (Abdallah et al., 2023). Despite

these, they should know that AI chatbots have shown potential in providing personalised support, improving communication, and reducing learning anxieties, which are essential considerations for curriculum design. Additionally, the use of AI chatbots in language learning has been associated with potential benefits such as reducing speech-related anxieties and learning inhibitions, which can be particularly relevant for language learners (Bao, 2019). Furthermore, AI chatbots can be utilised to provide individual student support, addressing the need for personalised learning, which is a crucial aspect of curriculum design.

Moreover, the integration of AI chatbots into educational settings has been shown to cater to students' learning needs through personalised learning approaches, experiential and collaborative learning, and predetermined conversational paths, aligning with the principles of effective curriculum design (Kuhail et al., 2022). Finally, AI chatbots can adjust the proficiency level, provide personalised learning materials, and suggest customised learning paths, which are essential considerations for designing effective and adaptive curricula (Kohnke et al., 2023). After completing this study, the intention of the researcher is to pursue employment at secondary level education in Greece, where the use of AI chatbots and applications will be more prominent than ever before. Most specifically, AI tools will be used:

- 1- In all English lessons, involving as many English language skills as possible.
- 2- For the creation of new tasks and supplementary materials.
- 3- For more effective feedback purposes, not unlike what has taken place during the study, which will require the engagement and attention of learners.

However, the biggest ambition of the researcher does not lie in this pedagogical or even methodological implications. It focuses on research, and the expansion of a new trend in linguistics: technolinguistics. Technolinguistics, also known as technology linguistics, is an emerging area of research that explores the intersection of technology and language learning.

The literature on technolinguistics encompasses various aspects, including the use of technology for language teaching, the impact of technology on language learning, and the development of innovative tools for linguistic analysis and language education.

Zhang (2019) proposed the concept of techno-linguistics as a research area to better benefit language learners in the digitalised world, highlighting the potential for technology to transform language education. This concept reflects the growing interest in leveraging technology to enhance language learning experiences and pedagogical practices. An older study by Zhao (2013) underlined the limited existing literature on the effectiveness of technology in language education, pointing out the scarcity of well-designed empirical studies and the focus on higher education and common foreign languages. This highlights the need for further research and empirical evaluation in the field of technolinguistics to better understand the impact of technology on language learning across diverse educational contexts.

Furthermore, the study by Shadieff & Yang (2020) focused on technology-enhanced language learning and teaching, stressing the importance of using technologies for language learning and teaching, particularly in the context of educational technology. This underscores the relevance of technology in language education and the potential for innovative approaches to language learning through the integration of technology. Also, the development of technology-enhanced language learning tools, such as AI chatbots and intelligent tutoring systems, has been a subject of interest in the literature. Nye (2014) discussed the trends and approaches for intelligent tutoring systems in a global context, highlighting the impact of technology on educational practices in both developed and developing countries. This demonstrates the global relevance of technolinguistics and the potential for technology to address diverse educational needs.

The study and its findings can work as supplement to the emerging trend of technolinguistics. The study made the methodological decision to measure the proportion of correct uses of written language before and after the AI intervened and presented correct forms of language. This could provide a new way to measure the effectiveness of AI chatbots, before they can be more extensively used in the learning process. Additional research that will be done in the future, focusing on the phonological aspects of errors made by Greek learners can be an additional asset in further establishing the effect of more recent technological achievements in the overall improvement of language acquisition and language teaching.

As a final implication point, it should be noted that the research questions in the present study focus on the production of as much error-free language as possible. While producing completely error-free language is something that some of the participants in this study would definitely desire, as this would enforce their performance in communication across a variety of contexts, achieving it might not be entirely possible. After all, it is crucial to understand that errors are inherent in language use, even among native speakers (Hanulíková et al., 2012). In addition, when it comes to second language acquisition, Derwing & Munro (2005) believe that the emphasis should be on ensuring mutual understanding in global communication, rather than pursuing an error-free competence. In truth, it is preferable to understand and analyse language errors, as they can offer valuable insights for language learning, teaching, and communication – a point that should be taken into consideration from curriculum and material designers.

6.5 Future research

While this study began with the concept of using technology to improve the linguistic output of adult Greek learners of English, it managed to fill in the research gaps that are focused on the types of mistakes adult Greek learners of English usually make while learning the

language. However, due to the limitations of this study that were mentioned before in this chapter, further research could be directed to address those limitations, as well as to address other aspects of artificial intelligence technologies.

First of all, the most important type of research that should be undertaken is the use of artificial intelligence chatbots to test whether errors related to the phonology of adult Greek learners of English can be improved. This could work due to the chatbots' ability to analyse the participants' speech and respond as a normal person would. This is a feature that is offered on one of the chatbots used in this present study and could possibly be available to more chatbots in the future. A project that focuses on this research idea could be inspired by the methodological processes of this project, and the findings of that potential future research can be supplementary to those of this project. The current project and its findings could also inspire similar research projects that involve learners of other nationalities, where the study of the English language is of equal importance.

Secondly, considering the fact that the current research project requested the participation of volunteers for thirteen weeks, future research projects could investigate the impact of AI chatbots on language proficiency among learners for a longer period, possible for an entire academic year, and over a wider selection of language areas and topics that involve all the English language skills. Similar to this project, future projects could also compare the effectiveness of traditional language learning methods, technology-enhanced methods (CALL or MALL tools) and AI-integrated methods. Other future studies could focus exclusively on the use of chatbots, which could include a pre-task and a post-task design using only this form of technology. For instance, students would not be exposed to any forms of teaching. Instead, they could complete a pre-test task (in which mistakes would be counted), they would engage in an AI chatbot task as a form of treatment and could complete a post-test task as a form of treatment,

in which mistakes would again be counted. This is only a suggestion, but this could further enhance the role of the AI chatbots as a corrective feedback provider and a means for learners to improve their linguistic output.

Since these points were discussed by the participants in the interviews and the questionnaires, it would be important to investigate the perceptions of both learners and teachers when it comes to the use of artificial intelligence tools in the learning context. While there have been relevant studies regarding this research topic (e.g., Williams, 2021; Lin, 2022), there have not been studies involving Greek learners and teachers of EFL; therefore, relevant research could fill a gap in the literature. This could also inspect the motivational levels of using these types of technology, therefore linking with motivational studies regarding the use of technology in general. Finally, the most important aspect of research could involve the use of generative artificial intelligence tools, such as Chat-GPT. Since they provide more capabilities of interaction and generation of materials compared to the more limited chatbots, they could open a new window for potential research based on the creation of teaching and learning materials, as well as practice opportunities that can be used by learners at their own leisure.

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Appendix A: UCLAN ethics committee approval letter



University of Central Lancashire
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28 April 2023

Nicola Halenko / Konstantinos Papamitrou
School of Humanities, Language and Global Studies
University of Central Lancashire

Dear Nicola and Konstantinos,

Re: BAHSS2 Ethics Panel Application
Unique Reference Number: BAHSS2 0228 Stage 3

The BAHSS2 Ethics Review Panel has granted approval of your proposal application, 'Fossilisation and technology: exploring ways of overcoming erroneous language acquisition via computer-assisted tools and artificial intelligence for Greek adult learners of English as a Foreign Language'.

Approval is granted up to the end of project date*.

It is your responsibility to ensure that

- the project is carried out in line with the information provided in the forms you have submitted
- you regularly re-consider the ethical issues that may be raised in generating and analysing your data
- any proposed amendments/changes to the project are raised with, and approved, by the Committee
- you notify ethicsinfo@uclan.ac.uk if the end date changes or the project does not start
- serious adverse events that occur from the project are reported to the Panel
- a closure report is submitted to complete the ethics governance procedures (Existing paperwork can be used for this purpose e.g. funder's end of grant report; abstract for student award or NRES final report. If none of these are available use [e-Ethics Closure Report Proforma](#)).

Yours sincerely

Helen Richardson Foster
Deputy Vice-Chair **BAHSS2**
Ethics Panel

* for research degree students this will be the final lapse date

NB - Ethical approval is contingent on any health and safety checklists having been completed, and necessary approvals gained.

Appendix B: Participants' Information Sheet



Where opportunity creates success

Research project information sheet for participants

Project Title: Fossilisation and technology: exploring ways of overcoming erroneous language acquisition via computer-assisted tools and artificial intelligence for Greek adult learners of English as a Foreign Language.

My name is Konstantinos Papamitrou, and I am a full-time research student at the University of Central Lancashire. I would like to invite you to take part in a research study about improving the amount of oral and written language errors Greek adult learners of English as a Foreign Language make. The data will be collected with the use of computer-assisted tools and artificial intelligence technologies. Please take time to read the following information carefully before you decide whether or not you wish to take part.

Purpose of the study: Various studies have indicated that adult learners of second (or additional) foreign languages do not achieve the same level of mastery as young learners do. This is evident in the types of mistakes they make; mistakes that do not seem to improve and are often repeated, despite the amount of instruction that is provided. These mistakes are connected to a phenomenon called 'fossilisation', which is about the inability of language to further develop. A possible solution to this problem, which is investigated in this research project, is the use of different forms of technology, including computer-assisted educational tools and artificial-intelligence applications. These types of technology will focus on the instruction of English language features that often cause difficulties to adult learners and measure the level of improvement over an academic semester (approximately 4 months).

Your involvement in the study: You are being asked to participate in this research as a Greek adult learner of English yourself. As a participant, you will share your knowledge and understanding of the language, along with valuable input regarding potential mistakes you might make.

Voluntary participation and right to withdraw. Your participation is voluntary, and you may withdraw from the study at any time and for any reason until the end of December 2021.

What you will be asked to do if you take part: If you decide to take part in this research project, this will involve the following:

- a) Filling out an online personal background questionnaire and signing a confidentiality agreement.
- b) Completing a multiple-choice test, which focuses on the most common mistakes Greek learners make regarding spoken or written language.
- c) Participating in weekly teaching sessions. Sessions are expected to last for approximately 100 minutes, and will be conducted online.
- d) Completing tasks related to the language features you will have been taught. These include computer-based tasks and/or online activities that will be posted in the online platform you will be given access.
- e) Participating in forum-based discussions. Each week you will be given a topic to discuss with other participants of the project.
- f) Download/access through your social media account an artificial-intelligence chatbot. You will be using it to discuss about something specific and send a copy of your interaction to me.
- g) Delete all the research-based materials/applications from your personal devices after the end of the project.

After you fill an initial background questionnaire, you will be assigned to a group of learners with similar interests and experience regarding the discussions component of the project. The teaching sessions will be weekly and you will be given ample time to perform the requested tasks before the start of the next session.

How will your information be used and stored:

The following table best explains the procedure that will be taken regarding the collection, storage, use and removal of your data:

How will my data be collected?	Your data includes the responses from the activities that will be done through the course. Responses from your homework will be collected through Google Classroom, and you will be responsible to send a copy of your transcript with the AI chatbot on my email address.
How will my data be stored?	Your data will be stored online , on Microsoft's cloud service, OneDrive . No data will be stored in a computer/physical medium (e.g. USB).
How long will my data be stored for?	Your data will be stored online until the study is completed.
What measures are in place to protect the security and confidentiality of my data?	OneDrive is an online, encrypted space that will ensure protecting the security of the collected data. As an extra layer of protection, the data will be stored in a password-protected, shared folder between myself and the Director of Studies.
Will my data be anonymised?	While I will still have access to your names and email addresses, the analysis and presentation of your data will be coded, in order to ensure the anonymity of your data.
How will my data be used?	Your responses to homework and the transcripts you provide will be analysed. The number of mistakes you make will be recorded and will be used to identify any improvements on your performance. It is also possible that these findings will be used for presentations/papers in conferences/publications while the project is still ongoing.
Who will have access to my data?	The data you provide will be accessed by me and my Director of Studies, Dr. Nicola Halenko. No other member of the supervisory team, or any other party, will have access to your data.
Will my data be archived for use in other research projects in the future?	The collected data will be deleted after the completion of the study. None of it will be used in other future projects.
How will my data be destroyed?	All the study-related files and folders that contain your data will be deleted from OneDrive manually, the moment this study is completed.

Are there any risks involved? This project will have absolutely no effects on you in a physical, or psychological level. In fact, your full participation can ensure in providing enough data that might be able to improve the

learning conditions of many adult learners who might be experiencing similar difficulties as you have/had.

Are there any benefits from taking part in the study? While no monetary rewards have been arranged for this study, you will be given the opportunity to participate in courses that have been carefully designed **free of charge**. Additionally, all the materials will be provided to you, so there is no need to spend money in materials. Finally, as the course will be delivered online, no purchases or travel costs are required.

What will happen to the results of the study? As mentioned before, the results of the collected data will be predominantly used for the purposes of this study. They will be used to test the original research hypothesis and to see whether the use of technology is enough to improve the overall use of language. Some parts of the collected data will also be used in any presentations that will take place before the completion of the study, or in possible articles/papers that might be published within this time period.

I am more than happy to share copies of any published materials/presentations the collected data will be used. If you want to have access to those materials, you can send me an email in which you can request access. I will be posting messages on Google Classroom if any presentations/publications are due to take place, and I will happily share copies of these documents to you, if you wish.

What will happen if I want to stop taking part? While it is expected that you will continue being part of the study until the end, you are free to withdraw from the study at any given point from the start until December 10, 2021. Data analysis will begin at the beginning of December; therefore, your participation until the end (early January 2022) is required.

To stop taking part in the study, you will need to send me an email, stating that you wish to withdraw from the study. **You do not need to express a reason why you wish to withdraw at this stage**. I will immediately delete the data that is collected from you, and will let you know that you are no longer part of the study. Please remember that, after December 10, I will no longer be able to accommodate your request.

Still, in case there is a very important reason that does not allow you to continue after December 10, please let me know of that reason. I will explore other ways to accommodate you and keep you in the program for the remaining of the study. If we are both unable to find a way to keep working together, you will be allowed to stop. Note that all the collected data will **not** be deleted though, and will be used for analysis purposes.

What if I am unhappy, or there is a problem? If you are unhappy, or if there is a problem, please feel free to let us know by contacting me at KPapamitrou2@uclan.ac.uk, and/or my supervisor, Dr. Nicola Halenko at NHalenko@uclan.ac.uk and we will try to help. If you remain unhappy, or have a complaint which you feel you cannot come to us with, then please contact the Ethics, Integrity and Governance Unit at OfficerForEthics@uclan.ac.uk.

The University strives to maintain the highest standards of rigour in the processing of your data. However, if you have any concerns about the way in which the University processes your personal data, it is important that you are aware of your right to lodge a complaint with the Information Commissioner's Office by calling 0303 123 1113.

If I have more questions about this project, who can I contact? Please contact myself at KPapamitrou2@uclan.ac.uk, and/or my supervisor, Dr. Nicola Halenko at NHalenko@uclan.ac.uk for more information or to answer any further questions you may have. This research has been approved by the University Research Ethics Committee but if you have any concerns about the way in which the study has been conducted, you should contact the University Officer for Ethics at OfficerforEthics@uclan.ac.uk. Details of UCLan's privacy policy can be found here https://www.uclan.ac.uk/data_protection/privacy-notice-research-participants.php

Thank you in advance for your participation in this project.

Appendix C: Participants' Consent Form

Consent form

Research project title: Fossilisation and technology: exploring ways of overcoming erroneous language acquisition via computer-assisted tools and artificial intelligence for Greek adult learners of English as a Foreign Language.

Name of researcher: Konstantinos Papamitrou

PLEASE MARK EITHER 'YES' OR 'NO' FOR EVERY STATEMENT BELOW:

<u>Consent for participation:</u>	Yes	No
I consent to having my responses in the online tasks for the specific research project identified in the information sheet overleaf. I have been given the opportunity to ask questions.	<input type="checkbox"/>	<input type="checkbox"/>
I consent to having parts of my interaction with the artificial intelligence application(s) for the specific research project identified in the information sheet overleaf. I have been given the opportunity to ask questions.	<input type="checkbox"/>	<input type="checkbox"/>
I understand that I have the right to terminate my participation at any point of the study, but not after December 31 st , 2021. The data from my responses will be deleted on request.	<input type="checkbox"/>	<input type="checkbox"/>
<u>Anonymity/identification:</u>	Yes	No
I agree that my name and personal details will only be accessed by the researcher of the study and will not be shared or accessed by anyone else. I also understand that any personal data will be coded to ensure my anonymity, if need arises to share the findings with other people.	<input type="checkbox"/>	<input type="checkbox"/>
<u>Researcher use of data:</u>	Yes	No
I agree that the data and any measurements drawn from it may be kept permanently by the researcher of the study and used for the specific research project. The collected data will be kept for a period of two years, after which it will be deleted.	<input type="checkbox"/>	<input type="checkbox"/>
I agree that the data and any analyses drawn from it may be used by the above-named researcher, for research purposes, in professional presentations and publications, as well as the development of teaching innovations/technologies. However, all the data will be anonymised/coded, in order to ensure the complete anonymity of the participants.	<input type="checkbox"/>	<input type="checkbox"/>
<u>Participation in the project's online learning environment (Google Classroom)</u>	Yes	No
I agree to participate in the above-mentioned online learning environment to develop my own language skills, contribute to the understanding of my peers' linguistic abilities, and support the development of the research project.	<input type="checkbox"/>	<input type="checkbox"/>
<u>Participation in a future online questionnaire (learners):</u>	Yes	No
I agree to complete an evaluative online questionnaire about my personal experiences of the value of the learning environment & tools regarding my perception of the mistakes, along with the way they were addressed through the project.	<input type="checkbox"/>	<input type="checkbox"/>
If you provide your consent to the participation in the learning environment and the questionnaire for learners, please provide your email address to contact you at a later stage:		

Appendix D: Sample Unit Materials (Session on Conditionals)

Lesson Plan: Exploring Conditionals in English Language

Objective: Students will understand the concept of conditionals in English language, specifically focusing on the four types of conditionals (zero, first, second, and third) and their usage in written and spoken communication. They will also be exposed to the concept of mixed conditionals, various styles and registers regarding the conditionals and other relevant structures.

Duration: 90 minutes

Introduction (15-20 minutes):

1. Session Quiz (10 minutes):

- Start with a short quiz regarding the contents of the session. Discuss the answers with the Is and elicit relevant responses.

2. Pre-Discussion (5-10 minutes):

- Ss watch a short video from Once Upon A Time (<https://www.youtube.com/watch?v=NnONBkEQUU0&t>). Elicit responses regarding the type of conditionals and what would have happened if she hadn't found him.

Main Session (30 minutes):

1. Zero Conditional

- Introduce the zero conditional, emphasizing its use for general truths and facts.
- Provide examples and discuss the structure of the zero conditional.

2. First Conditional

- Move on to the first conditional, used for real and possible situations in the present or future.
- Discuss the structure and provide examples to illustrate its use.

3. Second Conditional

- Present the second conditional, which is used for unreal or improbable situations in the present or future.
- Offer examples and highlight the structure of the second conditional.

4. Third Conditional

- Introduce the third conditional, used for unreal situations in the past.
- Provide examples and discuss the structure of the third conditional.

5. Mixed Conditionals

- Introduce the mixed conditionals, used for hypothetical situations in the present and the past.
- Provide examples and discuss the structure of the third conditional.

6. Temporal Clauses, Style and Register

- Present the alternative ways of introducing conditional clauses.
- Provide examples reflecting the different styles and registers of conditional clauses.

7. Inversion in Conditionals & Conditionals without -if

- Present the alternative ways of introducing conditional clauses, without using -if.
- Discuss how inversion works in conditionals.
- Provide examples reflecting the different styles and registers of conditional clauses.

Tasks (30 minutes):

- **Practice Tasks**

Ss will engage in single and group tasks. Some tasks will be given in separate Word documents.

Conclusion and Homework (5 minutes):

1. **Recap and Summary (3 minutes):**

- Summarise the key concepts of each conditional type.

2. **Homework Assignment (2 minutes):**

- Assign homework that involves creating sentences using different conditionals. Direct Ss to their Google classroom session.

Quick Quiz

Choose the correct answer.

- 1) I promise to call you the minute I ___ any news.
a) heard b) will hear c) hear
- 2) If metal ___ it expands.
a) is heated b) was heated c) will be heated
- 3) The medicine won't be effective if it ___ on an empty stomach.
a) was taken b) is taken c) will be taken
- 4) If we ought to be on form tomorrow, we ___ an early night.
a) ought to get b) would get c) can get
- 5) Terry would take a day off if he ___ so much work to do
a) wouldn't have b) hadn't had c) didn't have

Quick Quiz

- 6) If they were to offer you the part, ___ it?
a) were you accepting b) would you accept c) did you accept
- 7) If you have read this book, ___ it to the library.
a) return b) returns c) returned
- 8) I would never have remembered all the details if I ___ notes.
a) didn't take b) hadn't taken c) wouldn't have taken
- 9) Supposing you lost your job, what ___?
a) will you do b) would you do c) would you have done
- 10) If you ___ me, I'll take you to the managing director's office.
a) followed b) will follow c) were to follow

ZERO CONDITIONAL – True in the present

**If + Present
Tense/modal,**

**Present
Simple/Modal**

**Facts, truths,
habitual results
in the present**

**If I work in the
garden, I get
backache.**

**She can get sick if
she eats
tomorrow**

Notice anything in the structure of the examples?

FIRST CONDITIONAL – Possible in the present/future

If + Present Simple	Future	Real situations will possible outcomes in present/future	If she keeps calm, she'll pass the test. Paul won't win if he doesn't train.
If + Present Simple	Modal	Ability, possibility, advice (depending on the meaning of the modal)	If we arrive early, we can have lunch. If you need to lose weight, you must eat less bread.
If + Present tense	Imperative	Emphasising different things depending on choice of tense	If you need any help, just phone me. (instructions) If you have read the book, give it back to me. (emphasising completion)
If + Present Tense	future		If you're coming tonight, will John be coming too? (checking intention/plan)

SECOND CONDITIONAL – unlikely/improbable in the present/future

If + Past Simple/Past Continuous	Would/could/might	<ul style="list-style-type: none"> Hypothetical/unreal situations Hopes/regrets advice 	If I had her number, I'd phone her. If we didn't have to finish the project today, we could go out. If I were you, I'd become friends with her.
If + were to + bare infinitive	Would/could/might	Emphasising that the situation is unlikely (formal English)	If he were to apologise, would you forgive him? (=if he apologised)
If + Past Simple/Past Continuous	Past Simple	True or habitual actions in the past	If he ate chocolate, he got stomach ache.

THIRD CONDITIONAL – impossible in the past

If + Past Perfect Simple/Past Perfect Continuous	Would have/could have/might have	Unfulfilled condition in the past Satisfaction/regret over past action	If I hadn't been waiting for that flight, I'd never have met her (I was waiting and we did meet) If we hadn't arrived so are, we might have got tickets.
If + Modal Perfect	Modal Perfect	Hypothetical situation in the past	If you could have stayed another day, I would have taken you to the sea (but you couldn't stay)

MIXED CONDITIONALS (2nd + 3rd, 3rd + 2nd)

If + Past Simple/Past Continuous	Would have	Hypothetical present connected with hypothetical past result)	If Jane were slightly taller, the model agency would have accepted her.
If + Past Perfect	Would/could/might	Hypothetical past with hypothetical present result	If the patient hadn't been vaccinated as a child, his life would be in danger now.

TEMPORAL CLAUSES – time word + present + future

Clauses that begin with certain time expressions and carry a future meaning use similar structures to the first conditionals

Time words include: **when, until, till, as soon as, as long as, the moment (that), after, before, once, by the time**

- As soon as we arrive, we'll call you.
- They will sit in the garden until it gets dark

STYLE AND REGISTER

Unless can often replace if...not . It is followed by a positive verb	You will miss the train unless you leave at once (=if you don't leave) She wouldn't come unless you gave her a lift.
If...then is sometimes used to suggest that one action is dependent on another. (two co-dependent actions)	If Tom can't visit us, then we'll have to visit him.
If + will/won't is used in polite/formal requests (refers to willingness or refusal) If + would is also possible (even more formal)	If you will come this way, please, I'll show you to your room. If you would like to wait here, I'll call the manager.
Would is commonly used in both clauses in informal American English	It would be better if they would give everyone an exact appointment.
If + adjective sometimes replaces <i>if+subject+be</i> in the first conditional.	If possible , let me know by Friday (= <i>if it is possible</i>)

STYLE AND REGISTER

If in doubt is used in formal language and written instructions.	If in doubt , consult a doctor. (=if you are in doubt)
If so/If not are shortened forms of conditional clauses and refer to previous statements.	Are you coming to the party? If so , I'll give you a lift (=if you are coming). If not , I'll see you next week.
If + any/anything/ever , etc. is used in questions or negative sentences and expresses doubt about the truth of something.	There is little chance, if any , that he will recover (=if there is any chance at all...which I doubt) We are not doing anything special to celebrate our anniversary. If anything , we may go out for dinner (=if we do anything at all)
Happen to / should happen to shows chance/possibility.	If you happen to see John, see my regards.
Were not for / had not been for are used to show that one action depends on another But for + noun/pronoun is a shorter way of saying <i>were it not for/had it not been for</i> in formal English	If it hadn't been for Heather, the company would have failed. But for Heather, the company would have failed.

INVERSION IN CONDITIONALS

- Conditionals can become more formal by omitting *if* and starting the conditional clause with *should*, *were* or *had*.

First Conditional: **Should you hear** anything, let me know.

Second Conditional: **Were you to sign** the contract now, you could start work on Monday.

Third Conditional: **Had you made** him an offer, he might have accepted.

CONDITIONAL SENTENCES WITHOUT –IF

Suppose/Supposing	Means “what if” and is followed by a question in the main clause	Suppose he arrives early, what will we do? Supposing that he had come by train, would he have arrived any earlier?
Otherwise	Means “if not” and comes instead of a conditional clause	We really must hurry. Otherwise , we will miss our flight.
As long as/so long as/on condition (that)/providing (that)/provided (that)	Express an idea of strong limitation.	He would come on condition that we gave him a lift.
In case	Refers to conditions that may/may not happen. Also refers to things we do in order to be ready for a future situation.	The policeman took a gun in case things got dangerous.
In case of + noun	Formal. Used in instructions. Means “if there is”	In case of fire , go to the nearest exit.

Practice Tasks

Choose the correct option.

- 1) If he leaves at 6 am, he ___ at work by 7 am.
a) will usually be b) may usually be c) is usually d) usually is
- 2) ___ complaining if you don't like the play.
a) You don't start b) Don't start c) Won't start d) You wouldn't start
- 3) If you ___ to me, I'll never forget you.
a) had lied b) are lying c) were lying d) were telling
- 4) If you know the truth about what happened, you ___ us.
a) should tell b) told c) had told d) were telling
- 5) If you ___ the project on time, you will be paid a bonus.
a) would finish b) had finished c) may finish d) finish

Practice Tasks

- 6) If you don't water plants, they___.
a) die b) would die c) should die d) might have died
- 7) ___, I wouldn't call her.
a) If I was you b) If I were you c) If were you d) If I had been you
- 8) ___ me the truth, I'd have known what to do.
a) If you were telling b) If you had told c) If you told d) Should you were telling
- 9) ___ the money, I would take an exotic holiday.
a) If I had b) If I had had c) If I'd have d) If I have
- 10) He won't be able to pass the exam if he___ hard.
a) didn't study b) won't study c) doesn't study d) couldn't study

Group Task

- Rewrite the sentences using the Second or Third Conditional.

- 1) He doesn't have a car, so he walks to work.
- 2) Sheila didn't know about the meeting because no one had informed her.
- 3) My father doesn't like pop music, so he doesn't buy any CDs of this kind.
- 4) Helen is depressed because the weather is gloomy.
- 5) You didn't attend the lecture, so you couldn't understand the notes.
- 6) He doesn't know any people in this neighborhood, so he feels lonely.
- 7) Tom didn't have enough money, so he couldn't buy the necklace.
- 8) He can't ride a motorbike, so he won't join us tomorrow.

Practice Tasks

- **Put the words in brackets into the correct tense or form.**
- 1. I'll let you take my car provided you ___ (drive) carefully
- 2. If the food hadn't been so bad, we ___ (not/complain) to the manager.
- 3. But for his help, we ___ (not/manage) to finish the project.
- 4. I wouldn't help him unless he ___ (beg) me.
- 5. Paul might have considered the job offer if he ___ (know) earlier.
- 6. He might buy the jacket if the price ___ (be) more reasonable.

Decide whether the following statements are correct or incorrect. Provide the correct answers.

	Correct	Incorrect
		Unless he will work hard, he won't pass this test.
	If she had had a car, she wouldn't have had to walk to work.	
	If you should meet Alex, give him this book.	
		Had it not been her help, I would have made a lot of mistakes.
		He wouldn't have fallen off the bike were he riding it more carefully.

		He will agree to do the washing-up provided you will dry the dishes.
	Only if Mary buys a motorcycle will she be able to avoid the traffic.	
		But for the heavy rain, they had gone cycling.
		He bought more cans of coke in case more guests would come.
	If she should be playing quietly in her room, don't disturb her.	
		If you should see Paul, you please tell him to call me.
		If you didn't speak to her that way yesterday, she wouldn't be upset.
	If I were to be left alone to finish my work, I would be able to help you later.	

	Were you to have spoken to Cathy, what would you have said?	
		Hadn't Mike left on time, he wouldn't have bumped into her on the bus.
	If I were to have been there, I would have lent a helping hand.	
		Paul had better have listened to his mother's advice.
		It's high time for us to decide where to go.
		The girls prefer playing in their room than playing outdoors.
	He'd rather she didn't spend so much money on clothes	
	We wish you wouldn't make so much noise	

		It would have been better to listen to what he was saying.
		I'd rather he studied medicine when he was still young.
		I'd sooner watch TV rather than read a book.
	If only my sister were here with me!	
	Why does she always treat people as though they were her slaves?	

Put the words in brackets into the correct tense/form

- If it ___(not/be) for Kate's skill, we ___ (lose) the match yesterday.
- You can borrow the car provided you ___ (bring) it back by noon.
- Suppose you ___ (win) the lottery, what would you buy?
- If it ___ (not/be) for Mary's intervention, we would ___ (still/be) in prison
- If you ___(speak) to him politely yesterday___ (he/act) this way now?
- We could get through all this work today if you ___ (help) us.
- He won't lend her any money unless she ___ (promise) to spend it wisely.
- He ___ (not/take) his car to work every day if the office weren't so far
- What if the police ___(not/appear) when we needed them?

Homework tasks

Match each phrase in bold with the phrase that best describes its function

chance possibility, emphasizing that something is unlikely, giving advice, emphasizing experience, making a polite offer

1. **If you've ever worked** as a waitress, you will know what I mean.

2. I could have finished sooner with a little help from you.
I would have been _____
Had _____
3. If Tracy insists on eating junk food, she can't expect to have clear skin.
Unless _____
If Tracy _____
4. If you ever get the chance to come to Greece, you can stay with us.
Should _____
If you happen _____
5. Would you take freelance work if it was offered to you?
Supposing _____
Were you _____

AI Chatbot task:

Talk with the chatbot about a what-if scenario regarding the Lord of the Rings. In this scenario, Gollum managed to obtain the Ring from Frodo and successfully escape from Mt. Doom.

Appendix E: Questionnaire

What is your gender?

- a) Male b) Female c) Other

Please define the age group to which you belong

- a) 18-20 b) 21-25 c) 26-30 d) 31+

What is your current level of English according to the most recent qualifications you own?

- a) B2 (FCE, ECCE, IELTS 5.5 to 6.5 or equivalent)
 b) C1 (CAE, MET C1, IELTS 7.0 to 8.0 or equivalent)
 c) C2 (CPE, ECPE, IELTS 8.5 to 9 or equivalent)

Which of the four English language skills you believe you are more confident with? (you can choose more than one)

- a) Listening
 b) Reading
 c) Writing
 d) Speaking

Questions regarding your progress prior to the study

In which of the four English language skills did you use to make more mistakes as a learner?

- a) Listening
 b) Reading
 c) Writing
 d) Speaking

Below there are some types of mistakes that are frequent among Greek learners of English. Choose the one(s) you remember making as a learner in the past/currently.

- a) Grammar mistakes (e.g. incorrect use of tenses, incorrect use of prepositions, incorrect subject/verb agreement)
 b) Sentence structure (e.g. missing subjects, missing prepositions)
 c) Errors in pronunciation (e.g. incorrect use of English-specific sounds, incorrect intonation)

Some students are often able to self-correct their mistakes. This is called 'noticing'. How much does noticing relate to you? Choose the correct number.

I always notice and correct my mistakes	I often notice and correct my mistakes	I sometimes notice and correct my mistakes	I seldom notice and correct my mistakes	I never notice and correct my mistakes.
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How important is error highlighting and correction for you during the lesson?

Very important	Important	I do not mind if it happens or not	Unimportant	Totally unimportant
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How important is producing error-free language to you?

It's really important to me.	I prefer not to make any mistakes, though I cannot avoid it completely.	It is fine with me; I have not really thought about it.	It is fine if I make mistakes every now and then.	I don't mind making mistakes.
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Imagine you get to talk on the phone with an English-speaking person as part of your work/studies. Which of the following scenarios best relate to you?

- a) Give the impression that you are a proficient user of the language by avoiding making mistakes in grammar and pronunciation, or by self-correcting a lot.
- b) Focus on communicating efficiently, without bothering about making a few mistakes.
- c) Try to speak loud and clear, even if you know that your pronunciation might cause problems in communication.
- d) Speak while thinking in your mother tongue (Greek), while not even considering to use the language the way English-speaking people do.
- e) Other (please write down on the box)

Questions related prior to your experience in the study.

The study was carried out online, using a variety of technology tools, such as Google Classroom and Microsoft Teams. How easy was it for you to engage with these tools?

Very easy	Easy	It felt OK	Difficult	Very difficult
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How effective do you believe teaching and learning has been while using these tools?

Very effective	Effective	Didn't make any difference	Not much effective	Not effective at all
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How was your overall experience using the recommended AI tools (Kuki/Replika) during the study?

Very positive	Positive	Didn't make any difference	Negative	Very negative
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How much effective do you believe that the AI tools that you used in the study are in detecting mistakes made in your work?

Very effective	Effective	Don't make any difference	Not much effective	Not effective at all
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In the future, do you believe that the use in AI can have a more permanent role in education?

Definitely	It's very likely	I'm not very sure	Not very likely	Not likely at all
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Appendix F: Interview Core Questions

Question 1: Given your experience and practice opportunities with the language, which level of English do you believe you have mastered?

Question 2: Why have you been studying English? How important is using the language to you?

Question 3: Out of all the English language skills, which one you believe you are more confident with, and which one you believe you are less confident?

Question 4: What types of mistakes did you use to make while learning English?

Question 5: What do you feel about making mistakes? Is it important to correct them? Why/Why not?

Question 6: How often do you notice and correct mistakes you make while you write something, or while you talk to other people?

Question 7: What do you think about the study you participated last year? Did it help you improve your written and spoken English?

Question 8: Do you think that the AI is a powerful/helpful tool that can be used effectively in the classroom?

Question 9: What is your opinion after using the AI chatbot in the study? Did you find it easy working with it?

Question 10: With the AI technologies constantly developing, would you recommend them to people who would like to find an easy way to practice their English language skills?

Appendix G: Full Descriptive Statistics

Descriptive statistics

Descriptive Statistics

	S1 HW Mistakes	S1 AI Mistakes before intervention	S1 AI Mistakes after intervention
Valid	34	34	34
Missing	0	0	0
Mean	2.941	1.500	0.235
Std. Deviation	1.890	1.187	0.496
Minimum	0.000	0.000	0.000
Maximum	6.000	4.000	2.000

Descriptive Statistics

	S2 HW Mistakes	S2 AI Mistakes before intervention	S2 AI Mistakes after intervention
Valid	34	34	34
Missing	0	0	0
Mean	1.765	0.912	0.235
Std. Deviation	1.232	0.712	0.431
Minimum	0.000	0.000	0.000
Maximum	4.000	2.000	1.000

Descriptive Statistics

	S3 HW Mistakes	S3 AI Mistakes before intervention	S3 AI Mistakes after intervention
Valid	34	34	34
Missing	0	0	0
Mean	2.824	1.059	0.206
Std. Deviation	1.267	0.814	0.410
Minimum	0.000	0.000	0.000
Maximum	4.000	3.000	1.000

Descriptive Statistics

	S4 HW Mistakes	S4 AI Mistakes before intervention	S4 AI Mistakes after intervention
Valid	34	34	34
Missing	0	0	0
Mean	2.706	0.765	0.088
Std. Deviation	1.467	0.654	0.288
Minimum	0.000	0.000	0.000
Maximum	5.000	2.000	1.000

Descriptive Statistics

	S5 HW Mistakes	S5 AI Mistakes before intervention	S5 AI Mistakes after intervention
Valid	34	34	34
Missing	0	0	0
Mean	1.647	0.794	0.029
Std. Deviation	0.981	0.687	0.171

Descriptive Statistics

	S5 HW Mistakes	S5 AI Mistakes before intervention	S5 AI Mistakes after intervention
Minimum	0.000	0.000	0.000
Maximum	3.000	2.000	1.000

Descriptive Statistics

	S6 HW Mistakes	S6 AI Mistakes before intervention	S6 AI Mistakes after intervention
Valid	34	34	34
Missing	0	0	0
Mean	2.882	0.882	0.088
Std. Deviation	1.250	0.640	0.288
Minimum	0.000	0.000	0.000
Maximum	4.000	2.000	1.000

Descriptive Statistics

	S7 HW Mistakes	S7 AI Mistakes before intervention	S7 AI Mistakes after intervention
Valid	34	34	34
Missing	0	0	0
Mean	2.235	0.176	0.059
Std. Deviation	0.955	0.459	0.239
Minimum	0.000	0.000	0.000
Maximum	3.000	2.000	1.000

Descriptive Statistics

	S8 HW Mistakes	S8 AI Mistakes before intervention	S8 AI Mistakes after intervention
Valid	34	34	34
Missing	0	0	0
Mean	2.529	0.441	0.029
Std. Deviation	1.051	0.504	0.171
Minimum	0.000	0.000	0.000
Maximum	4.000	1.000	1.000

Descriptive Statistics

	S9 HW Mistakes	S9 AI Mistakes before intervention	S9 AI Mistakes after intervention
Valid	34	34	34
Missing	0	0	0
Mean	2.647	0.147	0.029
Std. Deviation	1.704	0.436	0.171
Minimum	0.000	0.000	0.000
Maximum	5.000	2.000	1.000

Descriptive Statistics

	S10 HW Mistakes	S10 AI Mistakes before intervention	S10 AI Mistakes after intervention
Valid	34	34	34
Missing	0	0	0
Mean	2.176	0.441	0.029
Std. Deviation	1.114	0.561	0.171
Minimum	0.000	0.000	0.000
Maximum	3.000	2.000	1.000

Descriptive Statistics

	S11 HW Mistakes	S11 AI Mistakes before intervention	S11 AI Mistakes after intervention
Valid	34	34	34
Missing	0	0	0
Mean	2.176	0.147	0.029
Std. Deviation	1.507	0.359	0.171
Minimum	0.000	0.000	0.000
Maximum	5.000	1.000	1.000

Descriptive Statistics

	S12 HW Mistakes	S12 AI Mistakes before intervention	S12 AI Mistakes after intervention
Valid	34	34	34
Missing	0	0	0
Mean	1.235	0.118	0.059
Std. Deviation	0.890	0.327	0.239
Minimum	0.000	0.000	0.000
Maximum	3.000	1.000	1.000

Appendix G: Coded responses from participants

Points of view regarding making mistakes

<Files\\a) Participant 26> - § 1 reference coded [0.94% Coverage]
Reference 1 - 0.94% Coverage
not feeling ok by making mistakes
<Files\\b) Participant 21> - § 1 reference coded [1.07% Coverage]
Reference 1 - 1.07% Coverage
so the next time I am... I will not repeat them.
<Files\\c) Participant 31> - § 2 references coded [4.22% Coverage]
Reference 1 - 2.07% Coverage
I believe making mistakes is a natural part of learning a... any language. It's how we learn... and improve
Reference 2 - 2.15% Coverage
Correcting mistakes helps us improve our language skills overall... and avoid repeating them in the future.
<Files\\d) Participant 25> - § 1 reference coded [1.95% Coverage]
Reference 1 - 1.95% Coverage
. Also, in my work...it is important to write emails...and speak to other people with...without making mistakes...
<Files\\e) Participant 24> - § 1 reference coded [0.81% Coverage]
Reference 1 - 0.81% Coverage
because that way we get better all the time.
<Files\\f) Participant 33> - § 1 reference coded [1.86% Coverage]
Reference 1 - 1.86% Coverage
.I think making mistakes is normal when learning a language. It's how we learn and improve
<Files\\g) Participant 10> - § 1 reference coded [1.13% Coverage]
Reference 1 - 1.13% Coverage
Mistakes help us identify areas where we need improvement
<Files\\h) Participant 28> - § 1 reference coded [2.06% Coverage]
Reference 1 - 2.06% Coverage
Of course, it's important! Making mistakes is a critical...side of the process of learning a foreign language...
<Files\\i) Participant 12> - § 1 reference coded [0.70% Coverage]
Reference 1 - 0.70% Coverage
Making mistakes is an integral part of learning,
<Files\\j) Participant 20> - § 1 reference coded [0.54% Coverage]
Reference 1 - 0.54% Coverage
It allows us to learn from our errors,
<Files\\k) Participant 9> - § 1 reference coded [0.86% Coverage]
Reference 1 - 0.86% Coverage
is crucial for our improvement as learners.
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<Files\\l) Participant 19> - § 1 reference coded [1.64% Coverage]
Reference 1 - 1.64% Coverage
I would just try to communicate my ideas and just... and hope the other person understood me.
<Files\\m) Participant 11> - § 1 reference coded [1.47% Coverage]
Reference 1 - 1.47% Coverage
but most of the time, I just keep going without thinking too much on the errors.
<Files\\n) Participant 14> - § 1 reference coded [1.44% Coverage]
Reference 1 - 1.44% Coverage
Making mistakes is a natural part of learning, and we shouldn't be afraid of them...
<Files\\o) Participant 32> - § 1 reference coded [0.99% Coverage]
Reference 1 - 0.99% Coverage
Mistakes are an integral part of the learning process.
<Files\\p) Participant 34> - § 1 reference coded [1.00% Coverage]
Reference 1 - 1.00% Coverage
I mean, if you don't make mistakes, how are you supposed to learn?
<Files\\q) Participant 30> - § 1 reference coded [2.39% Coverage]
Reference 1 - 2.39% Coverage
When we make mistakes, it means we are pushing ourselves outside our comfort zone and actively engaging with the language.
<Files\\r) Participant 29> - § 1 reference coded [1.30% Coverage]
Reference 1 - 1.30% Coverage
. Mistakes help us find those areas where we need improvement
<Files\\s) Participant 3> - § 1 reference coded [0.94% Coverage]
Reference 1 - 0.94% Coverage
. Mistakes provide us learning opportunities
<Files\\t) Participant 6> - § 1 reference coded [2.14% Coverage]
Reference 1 - 2.14% Coverage
by making these mistakes they can grow and develop their skills and proficiency on what they learn.

Points of view regarding correcting mistakes

<Files\\a) Participant 26> - § 1 reference coded [1.03% Coverage]
Reference 1 - 1.03% Coverage
is important for me to correct them
<Files\\b) Participant 21> - § 1 reference coded [0.99% Coverage]
Reference 1 - 0.99% Coverage
it is important for me to correct my mistakes
<Files\\c) Participant 31> - § 1 reference coded [1.49% Coverage]
Reference 1 - 1.49% Coverage
I try to be... aware of mistakes... and correct them as soon as I notice them.
<Files\\d) Participant 25> - § 1 reference coded [1.05% Coverage]
Reference 1 - 1.05% Coverage

It's very important for me to correct my mistakes...because
<Files\\e) Participant 24> - § 1 reference coded [1.47% Coverage]
Reference 1 - 1.47% Coverage
If you don't correct your mistakes while learning...eh, you don't learn, I think...
<Files\\f) Participant 33> - § 1 reference coded [1.55% Coverage]
Reference 1 - 1.55% Coverage
It's very important to correct mistakes because it helps us... um... get better
<Files\\g) Participant 10> - § 1 reference coded [1.90% Coverage]
Reference 1 - 1.90% Coverage
Correcting mistakes helps us become better English speakers – or speakers of any other language.
<Files\\h) Participant 28> - § 1 reference coded [2.63% Coverage]
Reference 1 - 2.63% Coverage
If I don't get my mistakes corrected...I...I don't feel like I learn anything...so, it's absolutely important for the corrections to take place...
<Files\\i) Participant 12> - § 1 reference coded [4.79% Coverage]
Reference 1 - 4.79% Coverage
improvement. While it is important for me to speak fluently and without making mistakes because of my work, I am happy...when I notice a mistake and correct it on my own for example, when I speak...and I am happy if someone detects an issue in something I have written for example, like a report. Of course it's important to correct them.
<Files\\j) Participant 20> - § 1 reference coded [0.85% Coverage]
Reference 1 - 0.85% Coverage
correcting mistakes is crucial because it helps us improve...
<Files\\k) Participant 9> - § 1 reference coded [3.25% Coverage]
Reference 1 - 3.25% Coverage
It helps us learn from our errors, gain a better understanding of English, and become more proficient in the language skills we need for work and communication.
<Files\\l) Participant 19> - § 1 reference coded [1.08% Coverage]
Reference 1 - 1.08% Coverage
I don't think correcting every single mistake is necessary.
<Files\\m) Participant 11> - § 1 reference coded [0.93% Coverage]
Reference 1 - 0.93% Coverage
I don't think correcting every mistake is necessary.
<Files\\n) Participant 14> - § 1 reference coded [0.28% Coverage]
Reference 1 - 0.28% Coverage
Oh, absolutely!
<Files\\o) Participant 32> - § 1 reference coded [2.17% Coverage]
Reference 1 - 2.17% Coverage
Correcting mistakes allows us to refine our understanding, expand our knowledge, and

enhance our communication skills.
<Files\\p) Participant 34> - § 1 reference coded [2.71% Coverage]
Reference 1 - 2.71% Coverage
And if you don't have someone to show you your mistakes...show you how are... what is the correct way to say or write something, how can you learn not to repeat the same mistake again?
<Files\\q) Participant 30> - § 1 reference coded [2.89% Coverage]
Reference 1 - 2.89% Coverage
Correcting those mistakes with guidance from teachers or language tools helps us understand the correct usage and avoid repeating them in the future.
<Files\\r) Participant 29> - § 1 reference coded [3.42% Coverage]
Reference 1 - 3.42% Coverage
Correcting those mistakes, whether through self-correction or guidance from teachers, allows us to understand the correct usage and avoid repeating the same errors
<Files\\s) Participant 3> - § 1 reference coded [1.77% Coverage]
Reference 1 - 1.77% Coverage
By identifying and correcting our mistakes, we become more confident and proficient
<Files\\t) Participant 6> - § 1 reference coded [1.39% Coverage]
Reference 1 - 1.39% Coverage
correcting mistakes are very... very important in language learning.

Points of view regarding learning and using English at a high standard level.

<Files\\a) Participant 26> - § 1 reference coded [4.23% Coverage]
Reference 1 - 4.23% Coverage
It is important for me because... without it, I will not be able to do many projects in my job... and participate in meetings with worldwide companies...
<Files\\b) Participant 21> - § 1 reference coded [3.11% Coverage]
Reference 1 - 3.11% Coverage
I work for a bank as... as you know... and the English language is by the far the most spoken language worldwide and... absolutely necessary for...
<Files\\c) Participant 31> - § 1 reference coded [3.12% Coverage]
Reference 1 - 3.12% Coverage
I work in the IT industry... and English are essential for... for collaborations with international teams and... staying updated with the latest developments.
<Files\\d) Participant 25> - § 1 reference coded [3.08% Coverage]
Reference 1 - 3.08% Coverage
Being able to use the English language is very important to me...since everyone in our days learns it and we can communicate with each other easily...exchange opinions...
<Files\\e) Participant 24> - § 1 reference coded [1.02% Coverage]
Reference 1 - 1.02% Coverage
Using the language is important to me due to my studies.
<Files\\f) Participant 33> - § 1 reference coded [3.36% Coverage]

Reference 1 - 3.36% Coverage
English is an international language, and it's... important for travel and work. I want to be able to talk to people from different cultures... and understand them.
<Files\\g) Participant 10> - § 1 reference coded [4.52% Coverage]
Reference 1 - 4.52% Coverage
It's important for me to use the language effectively in my professional and personal life. Don't forget that I also have lots of family States-side, so I need to keep my English language skills at the highest level possible.
<Files\\h) Participant 28> - § 1 reference coded [3.21% Coverage]
Reference 1 - 3.21% Coverage
It's important for me to use the language correctly and...in a right way because it allows me to connect with people from different cultures... and... and different backgrounds.
<Files\\i) Participant 12> - § 1 reference coded [2.37% Coverage]
Reference 1 - 2.37% Coverage
I work at a travel agency, and I speak with agents and customers all around the world, so I need to... keep...maintain a high standard of English language...um...proficiency.
<Files\\j) Participant 20> - § 1 reference coded [7.04% Coverage]
Reference 1 - 7.04% Coverage
If I became a psychologist, I wouldn't probably care about English...a lot. But then I decided to...go to the interpreters' school, so that I could work at...archaeological locations and museums. I am very close to getting my licence...and I need to be able to speak English properly and fluently in order to be able to assist the visitors...all these English-speaking tourists who will be visiting these areas. So, using the language fluently and... effectively...is a key to a professional development...and
<Files\\k) Participant 9> - § 1 reference coded [2.05% Coverage]
Reference 1 - 2.05% Coverage
I've been studying English because it offers many opportunities in my personal and professional life.
<Files\\l) Participant 19> - § 1 reference coded [4.20% Coverage]
Reference 1 - 4.20% Coverage
I haven't been studying English with much enthusiasm. I started learning English as most Greek kids do...and I think I've learnt enough... My line of work doesn't require me to speak perfect English... so it's not really... a top priority for me.
<Files\\m) Participant 11> - § 2 references coded [2.39% Coverage]
Reference 1 - 0.79% Coverage
I haven't been actively studying English...
Reference 2 - 1.60% Coverage
I'm a teacher at a school after all... so I haven't invested much time to...make it perfect.
<Files\\n) Participant 14> - § 1 reference coded [5.63% Coverage]
Reference 1 - 5.63% Coverage
For me, English is like a magic key that opens doors to so many opportunities! I've been studying English because I want to connect with people from all around the world... I love chatting with strangers about things I love in... social media groups and forums... and I love sharing my passion for math with students globally.
<Files\\o) Participant 32> - § 1 reference coded [5.39% Coverage]
Reference 1 - 5.39% Coverage
as a medicine student, it's crucial for me to be able to communicate with colleagues, access research, and stay updated on advancements in the field. Additionally, English proficiency allows me to

connect with a wider audience and contribute to the international medical community effectively.
<Files\\p) Participant 34> - § 1 reference coded [7.72% Coverage]
Reference 1 - 7.72% Coverage
Most people start learning the language from a young age... however it didn't take me long... and I think this is...this happens to everybody... well, it didn't take me long to understand that English is a global language that opens doors to countless opportunities, both professionally and personally. It can provide you with more professional opportunities...plus you also might meet your special someone from another country and you can use English to communicate, just like me and my wife do... so, I think you get the idea...
<Files\\q) Participant 30> - § 1 reference coded [4.39% Coverage]
Reference 1 - 4.39% Coverage
it was necessary for me to study English to enhance my professional skills and be able to communicate with students from different backgrounds. Moreover, English is a global language that opens doors to various opportunities.
<Files\\r) Participant 29> - § 1 reference coded [4.15% Coverage]
Reference 1 - 4.15% Coverage
I chose to study English because I needed it to pursue my Master's degree in a foreign country. It was essential for me to be able to communicate with my professors and fellow students effectively.
<Files\\s) Participant 3> - § 1 reference coded [3.15% Coverage]
Reference 1 - 3.15% Coverage
In my line of work, communication with foreign travellers is great...and important... and being able to effectively communicate in English is essential.
<Files\\t) Participant 6> - § 1 reference coded [2.25% Coverage]
Reference 1 - 2.25% Coverage
As a Greek teacher, my primary focus is on teaching Greek rather than using English... in an extensive way...

Areas in which Greek learners make mistakes

<Files\\a) Participant 26> - § 2 references coded [0.49% Coverage]
References 1-2 - 0.49% Coverage
grammar mistakes...
<Files\\b) Participant 21> - § 2 references coded [1.36% Coverage]
References 1-2 - 1.36% Coverage
There were some grammar mistakes...but mostly sentence problems
<Files\\c) Participant 31> - § 3 references coded [2.13% Coverage]
References 1-2 - 1.23% Coverage
I had difficulty with verb tenses.. and sentence structure.
Reference 3 - 0.91% Coverage
Additionally, I struggled with pronunciation,

<Files\\d) Participant 25> - § 1 reference coded [0.44% Coverage]
Reference 1 - 0.44% Coverage
Grammar mistakes mostly...
<Files\\e) Participant 24> - § 1 reference coded [1.40% Coverage]
Reference 1 - 1.40% Coverage
While learning English... I had difficulties in Reported Speech and Subjunctive.
<Files\\f) Participant 33> - § 2 references coded [2.32% Coverage]
Reference 1 - 1.35% Coverage
Well, when I was learning, I made lots of mistakes with grammar.
Reference 2 - 0.97% Coverage
I also struggled with pronunciation, especially
<Files\\g) Participant 10> - § 2 references coded [2.95% Coverage]
Reference 1 - 0.93% Coverage
I used to make mistakes with sentence structure
Reference 2 - 2.02% Coverage
I made spelling mistakes because I used to mix up what I heard with how something is actually written
<Files\\h) Participant 28> - § 1 reference coded [4.17% Coverage]
Reference 1 - 4.17% Coverage
as I think back, one common mistake I made was with verb tenses. It took me some time to... completely understand the different... the changes in tenses and when to use them correctly. Another challenge for me was prepositions
<Files\\i) Participant 12> - § 3 references coded [2.02% Coverage]
References 1-2 - 0.99% Coverage
Some common errors included grammar mistakes and sentence structure...
Reference 3 - 1.02% Coverage
Additionally, pronunciation has been a continual area for improvement,
<Files\\j) Participant 20> - § 2 references coded [1.85% Coverage]

Reference 1 - 1.08% Coverage
I often struggle with grammar... tenses, prepositions, more...complex phenomena
Reference 2 - 0.77% Coverage
Vocabulary was another area where I faced challenges,
<Files\\k) Participant 9> - § 2 references coded [4.46% Coverage]
Reference 1 - 2.09% Coverage
I often struggled with grammar, especially tenses, prepositions, and some others, like reported speech...
Reference 2 - 2.37% Coverage
Vocabulary was another challenge, considering the numerous fixed expressions and phrasal verbs with multiple meanings.
<Files\\l) Participant 19> - § 2 references coded [2.76% Coverage]
Reference 1 - 0.63% Coverage
I struggle with some grammar points...
Reference 2 - 2.13% Coverage
sometimes it's difficult choosing the right words to express my thoughts in a clear...to express my thoughts successfully.
<Files\\m) Participant 11> - § 1 reference coded [2.82% Coverage]
Reference 1 - 2.82% Coverage
generally struggled in grammar, especially with what concerns tenses and everything else that comes with them, for example conditionals or reported speech...
<Files\\n) Participant 14> - § 1 reference coded [1.88% Coverage]
Reference 1 - 1.88% Coverage
I struggled with many things to tell you the truth... but yes, finding the right words was always challenging
<Files\\o) Participant 32> - § 1 reference coded [1.77% Coverage]
Reference 1 - 1.77% Coverage
but vocabulary... yes, I often tended to get confused over some similar words, or some phrasals...

<Files\\p) Participant 34> - § 1 reference coded [0.72% Coverage]
Reference 1 - 0.72% Coverage
I think I was generally struggling with grammar...
<Files\\q) Participant 30> - § 1 reference coded [1.94% Coverage]
Reference 1 - 1.94% Coverage
, I do have some difficulty with grammar, especially in areas like conditionals and the unreal past.
<Files\\r) Participant 29> - § 1 reference coded [1.01% Coverage]
Reference 1 - 1.01% Coverage
I think...like most people...that would be grammar.
<Files\\s) Participant 3> - § 2 references coded [0.83% Coverage]
References 1-2 - 0.83% Coverage
I'd say grammar? And vocabulary maybe?
<Files\\t) Participant 6> - § 1 reference coded [1.43% Coverage]
Reference 1 - 1.43% Coverage
Yes...I think that vocabulary is... I make mostly vocabulary mistakes.

Perceptions of using AI as a technology

<Files\\a) Participant 26> - § 1 reference coded [2.29% Coverage]
Reference 1 - 2.29% Coverage
It definitely helped me with written English... and somehow in spoken English too
<Files\\b) Participant 21> - § 1 reference coded [1.71% Coverage]
Reference 1 - 1.71% Coverage
Yes, it was very useful! I believe I improved both...written and spoken English.
<Files\\c) Participant 31> - § 1 reference coded [1.29% Coverage]
Reference 1 - 1.29% Coverage
It was a great experience... and I enjoyed using the AI chatbot.
<Files\\d) Participant 25> - § 1 reference coded [1.47% Coverage]

Reference 1 - 1.47% Coverage
I believe that AI is a very useful tool...and powerful...and can help people a lot...
<Files\\e) Participant 24> - § 2 references coded [1.90% Coverage]
Reference 1 - 1.33% Coverage
It helped me enough to improve some of the mistakes that I use[d] to make...
Reference 2 - 0.57% Coverage
I think that it's a useful tool,
<Files\\f) Participant 33> - § 2 references coded [0.83% Coverage]
Reference 1 - 0.50% Coverage
AI can be a helpful tool
Reference 2 - 0.33% Coverage
It's convenient
<Files\\g) Participant 10> - § 3 references coded [7.41% Coverage]
Reference 1 - 0.99% Coverage
I really found it easy and convenient to work with
Reference 2 - 1.94% Coverage
I would recommend AI technologies to individuals looking for additional ways to practice English.
Reference 3 - 4.48% Coverage
However, it's important to remember that real-life practice and interaction with native speakers are equally crucial for language learning. AI can be a valuable tool, but it should supplement human interaction, not replace it.
<Files\\h) Participant 28> - § 2 references coded [2.76% Coverage]
Reference 1 - 0.94% Coverage
Yes, I would definitely recommend AI technologies
Reference 2 - 1.82% Coverage
However, as I said before, people should never replace AI tools...any AI tool...with a human teacher...
<Files\\i) Participant 12> - § 2 references coded [5.17% Coverage]
Reference 1 - 2.30% Coverage

completely support the fact that there should be boundaries...limitations on its use...and that teachers should be trained to use technology, not be replaced by it.
Reference 2 - 2.87% Coverage
While AI technologies can offer additional practice opportunities, I would only recommend them...only if there's balance between their use and the human interaction. AI can be used as a supplementary tool
<Files\\j) Participant 20> - § 1 reference coded [0.77% Coverage]
Reference 1 - 0.77% Coverage
would highly recommend AI technologies to individuals
<Files\\k) Participant 9> - § 2 references coded [2.37% Coverage]
Reference 1 - 1.06% Coverage
The AI can be a powerful and effective tool for sure.
Reference 2 - 1.31% Coverage
but it cannot replace the value of real conversations with people
<Files\\l) Participant 19> - § 1 reference coded [1.21% Coverage]
Reference 1 - 1.21% Coverage
I believe the AI technology has a crucial role to play in the future
<Files\\m) Participant 11> - § 2 references coded [4.04% Coverage]
Reference 1 - 0.97% Coverage
yes... I would recommend AI technologies to individuals
Reference 2 - 3.07% Coverage
However, it's important to keep in mind that AI should be a companion, not a replacer...teachers need to keep their jobs and... I don't like to lose my job because of AI, eh?
<Files\\n) Participant 14> - § 1 reference coded [1.47% Coverage]
Reference 1 - 1.47% Coverage
absolutely, without a doubt! (enthusiastically) I would highly recommend AI chatbots
<Files\\o) Participant 32> - § 1 reference coded [1.83% Coverage]
Reference 1 - 1.83% Coverage
I remain somewhat skeptical about the extent of relying on AI for various aspects of everyday life.
<Files\\p) Participant 34> - § 2 references coded [3.22% Coverage]

Reference 1 - 1.77% Coverage
AI has the potential to greatly enhance convenience, the speed in doing things... and even creativity in various domains.
Reference 2 - 1.45% Coverage
However, it's important to strike a balance and ensure that AI is used ethically and responsibly.
<Files\\q) Participant 30> - § 2 references coded [2.58% Coverage]
Reference 1 - 0.84% Coverage
I believe that AI has tremendous potential
Reference 2 - 1.75% Coverage
While AI can be a valuable tool, I strongly believe in the importance of the human factor
<Files\\r) Participant 29> - § 1 reference coded [1.59% Coverage]
Reference 1 - 1.59% Coverage
I appreciate the benefits that technology brings to various aspects of life
<Files\\s) Participant 3> - § 1 reference coded [1.23% Coverage]
Reference 1 - 1.23% Coverage
I believe that AI can be a valuable tool in everyday life
<Files\\t) Participant 6> - § 2 references coded [2.02% Coverage]
References 1-2 - 2.02% Coverage
I appreciate the use of technology in the classroom, I must admit that I'm not a big fan of AI.

Perceptions of using AI as part of the educational process

<Files\\a) Participant 26> - § 2 references coded [4.58% Coverage]
Reference 1 - 0.69% Coverage
Well... it was OK...helpful...
Reference 2 - 3.89% Coverage
but I think that the most effective way of learning for me, is the human interaction with the professor. I prefer him than an AI tool.
<Files\\b) Participant 21> - § 2 references coded [4.05% Coverage]
Reference 1 - 2.54% Coverage

Yes, I strongly believe that AI is a tool that will be helpful in the classroom... but in combination with the teacher	
Reference 2 - 1.51% Coverage	
However, I think that the human reaction is very important for all.	
<Files\\c) Participant 31> - § 2 references coded [4.20% Coverage]	
Reference 1 - 1.45% Coverage	
I believe AI can be a powerful tool in the classroom...if used correctly.	
Reference 2 - 2.76% Coverage	
However, it's important to remember that human interaction... and guidance from teachers...they can't be replaced by any form of technology...	
<Files\\d) Participant 25> - § 2 references coded [3.32% Coverage]	
Reference 1 - 1.35% Coverage	
It's helpful... and it should be used wisely by teachers in the classroom.	
Reference 2 - 1.97% Coverage	
but it could never replace any human being, especially when someone is trying to learn a foreign language...	
<Files\\e) Participant 24> - § 2 references coded [2.19% Coverage]	
Reference 1 - 0.91% Coverage	
it should not replace any human being in the future	
Reference 2 - 1.27% Coverage	
If humans work together with the AI as a tool, it can be a great tool.	
<Files\\f) Participant 33> - § 2 references coded [3.63% Coverage]	
Reference 1 - 1.12% Coverage	
I think the AI is a great tool to be used in education	
Reference 2 - 2.51% Coverage	
but it cannot provide enough encouragement, guidance and support... so that's why the teacher is needed in the classroom...	
<Files\\g) Participant 10> - § 2 references coded [3.37% Coverage]	
Reference 1 - 1.13% Coverage	

Yes, I believe AI can be a useful tool in the classroom.
Reference 2 - 2.24% Coverage
However, it should be used in conjunction with a teacher who can provide proper instruction and pastoral support.
<Files\\h) Participant 28> - § 2 references coded [5.82% Coverage]
Reference 1 - 1.91% Coverage
it depends on the AI technology... but they have the...capacity to be a great helper in language learning...
Reference 2 - 3.90% Coverage
However, I want to stress that they should not replace teachers. Having a teacher who can provide explanations and... accurate...guidance though some...tough points... it is crucial for an ideal learning journey...
<Files\\i) Participant 12> - § 3 references coded [9.06% Coverage]
Reference 1 - 2.47% Coverage
AI lacks the cultural understanding and the... sensitivity that a human teacher can provide... and...and because of this it can't address our learning needs in a...in the same way...
Reference 2 - 1.66% Coverage
AI chatbots can be a helpful tool... for certain aspects of language learning, such as vocabulary... or grammar practice.
Reference 3 - 4.93% Coverage
AI is only a piece of technology, but it does not have a heart... it does not have a soul. It does not have feelings or...sentiments...that human teachers can display. It cannot engage in meaningful conversations or provide real-life examples... and experiences that are important for language acquisition... I hope you understand what I want to say here...
<Files\\j) Participant 20> - § 1 reference coded [1.23% Coverage]
Reference 1 - 1.23% Coverage
I believe that AI chatbots have the potential to start a new era in language learning.
<Files\\k) Participant 9> - § 2 references coded [4.64% Coverage]
Reference 1 - 2.79% Coverage
The AI can transform language learning, but it cannot replace the value of real conversations with people and learning from human teachers.
Reference 2 - 1.85% Coverage
I would recommend AI technologies to individuals seeking additional practice opportunities.

<Files\\l) Participant 19> - § 2 references coded [4.18% Coverage]
Reference 1 - 1.96% Coverage
Technology is rapidly growing, and using AI into language learning can improve the learning experience greatly.
Reference 2 - 2.22% Coverage
I recommend AI technologies without...without reservations to individuals who are looking for additional practice opportunities.
<Files\\m) Participant 11> - § 3 references coded [4.22% Coverage]
Reference 1 - 1.72% Coverage
I believe AI chatbots can be a very useful instrument when it comes down in language learning...
Reference 2 - 1.20% Coverage
While it didn't have a significant impact on my own language skills
Reference 3 - 1.29% Coverage
I can see how AI can benefit others in their language learning journey.
<Files\\n) Participant 14> - § 1 reference coded [2.05% Coverage]
Reference 1 - 2.05% Coverage
AI chatbots can be a game-changer in language learning... They provide instant and personalised practice opportunities...
<Files\\o) Participant 32> - § 3 references coded [3.85% Coverage]
References 1-2 - 2.45% Coverage
I believe that human interaction and guidance are crucial for a comprehensive language learning experience. AI can be a powerful tool,
Reference 3 - 1.41% Coverage
but it should supplement rather than replace human interaction and expertise.
<Files\\p) Participant 34> - § 2 references coded [3.00% Coverage]
Reference 1 - 1.04% Coverage
provide a convenient and accessible means of improving language skills
Reference 2 - 1.95% Coverage
can successfully support the more traditional language learning methods and provide learners with additional practice opportunities

<Files\\q) Participant 30> - § 3 references coded [7.98% Coverage]
Reference 1 - 2.64% Coverage
Teachers play a crucial role in providing guidance, motivation, and a personalised learning experience that AI cannot fully replicate.
Reference 2 - 2.78% Coverage
AI chatbots can be a valuable resource for language learners. They provide a convenient and accessible platform for practicing English skills.
Reference 3 - 2.56% Coverage
However, I would always emphasise the importance of combining AI tools with human interaction and guidance from qualified teachers.
<Files\\r) Participant 29> - § 2 references coded [3.71% Coverage]
Reference 1 - 1.72% Coverage
I must admit that I have reservations about the extensive use of AI in education.
Reference 2 - 1.99% Coverage
, I would not recommend AI chatbots as the primary method for improving English language skills
<Files\\s) Participant 3> - § 1 reference coded [2.21% Coverage]
Reference 1 - 2.21% Coverage
AI chatbots can be a fantastic resource for individuals looking to improve their English language skills
<Files\\t) Participant 6> - § 3 references coded [7.06% Coverage]
Reference 1 - 1.09% Coverage
While the AI tools provided some level of feedback,
References 2-3 - 5.97% Coverage
I personally may not be a fan of AI chatbots, I understand that different people... different learners and students have different preferences and learning styles. For those who enjoy using technology and find it helpful, AI chatbots can be a convenient resource for practicing English.

Frequency of self-correcting mistakes
<Files\\g) Participant 10> - § 2 references coded [2.99% Coverage]
Reference 1 - 1.33% Coverage
I make an effort to review my writing for errors and correct them.
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Reference 2 - 1.66% Coverage
When speaking, I try to pay attention to the feedback I receive and make adjustments
<Files\\h) Participant 28.> - § 2 references coded [5.82% Coverage]
Reference 1 - 1.22% Coverage
I try to proofread my writing and try to identify any mistakes.
Reference 2 - 4.60% Coverage
But when it comes to speaking, I sometimes struggle to understand if I make mistakes while speaking... Speaking takes place...you know, more...unconsciously and there is no...not enough time to think if I am making a mistake...and if I have to correct it.
<Files\\i) Participant 12> - § 1 reference coded [2.97% Coverage]
Reference 1 - 2.97% Coverage
I always attempt to proofread my work and strive to identify and correct any mistakes I come across. This is something I am doing almost every time I am writing something, and I think I am doing really well.
<Files\\j) Participant 20> - § 1 reference coded [1.70% Coverage]
Reference 1 - 1.70% Coverage
I didn't do it before...but now...after the study... every time I am writing something, I attempt to read something carefully
<Files\\k) Participant 9> - § 1 reference coded [0.92% Coverage]
Reference 1 - 0.92% Coverage
I don't think I actually notice my mistakes.
<Files\\l) Participant 19> - § 1 reference coded [3.71% Coverage]
Reference 1 - 3.71% Coverage
Honestly? I never paid much attention to the mistakes I made... I always believe that it's more important to get the message understood rather than focusing on speaking perfect English. So, I didn't bother too much
<Files\\m) Participant 11> - § 1 reference coded [1.01% Coverage]
Reference 1 - 1.01% Coverage
I don't actively notice and correct the mistakes I make.
<Files\\o) Participant 32> - § 1 reference coded [1.32% Coverage]
Reference 1 - 1.32% Coverage

It's essential to embrace mistakes as stepping stones towards progress... but it's not easy to detect them in your work...and it's not easy to change them

<Files\\h) Participant 28.> - § 1 reference coded [4.60% Coverage]

Reference 1 - 4.60% Coverage

But when it comes to speaking, I sometimes struggle to understand if I make mistakes while speaking... Speaking takes place...you know, more...unconsciously and there is no...not enough time to think if I am making a mistake...and if I have to correct it.