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Option: Linguistics

**Enhancing Student's Pronunciation through the Use of AI
Technologies: The Case of Second Year Students at the
University of 8 Mai 1945, Guelma.**

**A Dissertation Submitted to the Department of Letters and English Language in Partial
Fulfillment of the Requirements for the degree of Master in language and Culture**

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Dedication 1

To my esteemed father, Kamal, whose unwavering strength, guidance, and quiet belief in me have illuminated my path. Your steadfast presence has been the solid foundation upon which I stand.

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Abstract

The previous few years witnessed a far-reaching change in technology within both educational and non-educational contexts. Among these technological advancements, Artificial Intelligence (AI) in English as a Foreign Language learning has become one of the most prominent discussed topics, gaining significant attention and being increasingly integrated into the educational process. The current research aims to examine the effectiveness of AI technologies in fostering English pronunciation among students. The basic hypothesis adopted in this study proposes the use of AI technologies to enhance speaking proficiency. The descriptive quantitative method is employed to collect data by administering a questionnaire to one hundred forty-two students of the second-year license at the Department of Letters and English Language, University of 8 May 1945, Guelma. The findings from the questionnaire revealed a generally positive attitude among students toward using AI tools to improve their pronunciation. A significant majority of respondents agreed or strongly agreed that AI-based applications helped them recognize and correct their pronunciation errors more effectively in speaking activities. These results indicate that students not only accept but also appreciate the role of AI in supporting their language learning, especially in the area of pronunciation.

List of Abbreviations

L1: First Language

L2: Second Language

CPH: Critical Period Hypothesis

AI: Artificial Intelligence

EFL: English as a Foreign Language

FLL: Foreign Language Learning

ITS: Intelligent Tutoring Systems

NLP: Natural Language Processing

ASR: Automatic Speech Recognition

ML: Machine Learning

ALS: Adaptive Learning Systems

TTS: Text-to-Speech

UPM: Universal Perceptual Model

CAPT: Computer-Aided Pronunciation Teaching

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الملخص

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General Introduction

Pronunciation plays a crucial role in foreign language learning. For English foreign language learners, clear and accurate pronunciation not only improves comprehensibility but also boosts confidence and engagement in spoken interactions. Despite its importance, pronunciation often receives limited attention in language instruction, with many educators prioritizing grammar and vocabulary due to time constraints, lack of specialized training, or not having the right tools to give helpful feedback. As a result, many students struggle to develop native-like pronunciation, which can lead to frequent misunderstandings and a lack of confidence in speaking.

The rapid advancement of Artificial Intelligence (AI) technologies presents promising opportunities to revolutionize language learning, particularly in areas like pronunciation. AI-driven tools such as speech recognition, natural language processing, and machine learning algorithms enable personalized, real-time feedback and immersive practice environments. These technologies can simulate native speakers, analyze speech patterns, and offer corrective suggestions with high accuracy. By enhancing interactivity and individual learning paths, AI is reshaping how learners engage with languages, making practice more relevant, accessible, and effective than ever before.

Combining artificial intelligence (AI) technologies with pronunciation practice offers a promising way to overcome the limitations of typical learning. With AI technologies, learners can practice speaking in a more engaging and supportive environment, where they receive immediate and personalized feedback on their pronunciation. This allows them to improve at their own pace, which enhances both their speaking accuracy and overall communication abilities. AI technologies also encourage active learning and increase motivation by adapting to individual needs and tracking progress over time. As a result, AI-

driven pronunciation tools help transform language learning into a more interactive and impactful experience.

1. Statement of the problem

Many second-year students at the University of 8 Mai 1945, Guelma, face ongoing challenges with English pronunciation. These difficulties not only lower their confidence when speaking but also affect their communication skills and academic performance in English courses. Unfortunately, traditional methods often fall short of providing enough time, resources, or personalized feedback to help students improve their pronunciation. As a result, issues like incorrect stress, intonation, and articulation continue to hold them back. Although Artificial Intelligence (AI) tools offer real-time practice and personalized pronunciation feedback, they are not yet used neither in English language classrooms nor by learners at home. This creates a significant problem: students are missing out on modern and effective solutions that could help them overcome their pronunciation struggles. The main research question is:

- Does the use of AI technologies enhance EFL pronunciation?

2. Aims of the study

Pronunciation is crucial for effective communication, but many learners struggle due to limited practice and feedback. AI technologies provide instant, personalized support that helps students practice pronunciation more effectively and stay engaged. The aims of the current research are:

- To investigate the effectiveness of AI technologies in enhancing English pronunciation.

- To raise learners' awareness about the importance of AI technologies in enhancing their pronunciation.

- To identify specific AI Tools or applications that contribute to improving students' pronunciation.

3. Research hypothesis

Artificial Intelligence (AI) is creating new opportunities to improve pronunciation in foreign language learning. AI tools such as speech recognition and natural language processing provide instant and personalized feedback, making it easier for learners to correct their mistakes. This study assumes that using AI in pronunciation can enhance students' pronunciation. To test this assumption, the following hypotheses have been formulated:

H₁: If students use AI technologies, their pronunciation will improve.

The null hypothesis implies that no relation exists between the two variables:

H₀: If students use AI technologies, their pronunciation will not improve.

4. Research methodology and design

4.1 Research method

This research is conducted using a qualitative method to explore students' experiences and opinions about using AI technologies to improve their pronunciation. Data is collected through a questionnaire that includes both open-ended and closed-ended questions. This allows us to gather detailed insights as well as measurable information about how AI technologies enhance English pronunciation. The open-ended responses are analyzed using

thematic analysis to identify common themes and perspectives on the effectiveness of AI tools in improving pronunciation.

4.2. Population of the study

The population of this study is second-year students from the Department of English at Guelma University who are randomly selected. Second-year students are chosen because they have already learned the basics of English phonetics and pronunciation. This means that they are more ready to use and evaluate AI tools effectively. Their prior knowledge also enables them to interact with the tools more confidently and provide feedback that is both relevant and informed.

4.3. Research tools

The main research tool used in this study is a questionnaire, which was carefully designed to collect qualitative data from second-year students at the Department of English at Guelma University. The questionnaire includes both open-ended and closed-ended questions to explore students' experiences, perceptions, and attitudes toward using AI technologies to improve English pronunciation. Open-ended questions allow students to share detailed insights and personal reflections, while closed-ended questions provide structured data to support measurable analysis. This tool is not only used to gather rich responses but also to test the validity of the research hypothesis by examining whether AI tools have a noticeable impact on improving pronunciation. Through this tool, the aim is to gain a deeper understanding of the effectiveness of AI in enhancing pronunciation skills.

5. Structure of the dissertation

This dissertation is organized into three main chapters, preceded by a general introduction and followed by a conclusion. The first chapter, "English Pronunciation," examines the definition, importance, features, teaching approaches, and common challenges of pronunciation in foreign language learning. The second chapter, "AI Technologies," provides a definition and historical overview of Artificial Intelligence, explores various types of AI technologies, and discusses their significance, role, and limitations in enhancing foreign language pronunciation education. The third chapter, "Field Investigation," presents the research methodology, including the aims and description of the questionnaire, sample characteristics, data analysis, interpretation of results, and a summary of the main findings. The dissertation concludes with a summary of key findings, pedagogical recommendations, and suggestions for future research.

Chapter One

English Pronunciation

Introduction

English pronunciation serves as a core aspect of language proficiency, significantly impacting a learner's ability to communicate effectively. Individuals who demonstrate strong pronunciation skills are more readily understood, even amidst grammatical or lexical errors. This clarity in articulation ensures the accurate transmission of messages, thereby minimizing misunderstandings and fostering improved comprehension in spoken interactions. Conversely, learners struggling with poor pronunciation may encounter difficulties in making themselves understood, regardless of their grammatical accuracy. This deficiency can, unfortunately, contribute to feelings of self-consciousness, reluctance to engage in oral English activities, and potentially lower academic performance.

This chapter delves into the multifaceted domain of pronunciation in English as a Foreign Language. It begins by establishing a precise definition of pronunciation and then underscores its crucial importance in effective communication. The chapter then explores the relationship between pronunciation and intelligibility, clarifying how accurate sound production contributes to comprehension. Furthermore, the chapter differentiates pronunciation from fluency and accuracy, highlighting their distinct yet interconnected roles in language proficiency. To give a comprehensive understanding, it outlines the main features associated with pronunciation, specifically examining segmental features (individual sounds) and suprasegmental features (stress, intonation, rhythm). The chapter also investigates the various factors that affect EFL learners' pronunciation development. Finally, it addresses the instructional aspects of teaching pronunciation, reviewing different approaches employed in the language classroom.

1.1. Definition of pronunciation

The term pronunciation encompasses how language is spoken, essentially how words are uttered and how an individual articulates the sounds of a language (Hornby, 1995, p.928). Similarly, Lado (1964) defined pronunciation as “the use of the sound system in speaking and listening” (p.70). In other words, it's the process of how we say words when we speak. It's the way our mouth, tongue, and voice work together to make the sounds of a word. Every language has its own special sounds and rules for saying words correctly.

In addition, Kelly (2002) defined pronunciation as the complex process encompassing both the articulation and the auditory recognition of a language's phonologically significant units. (p.05). That is, pronunciation involves not only the physical production of speech sounds but also the perception and interpretation of these sounds' listeners. This definition emphasizes the dual capacity required for effective pronunciation, which is fundamental to the successful conveyance and interpretation of meaning.

Furthermore, Paulson and Burder argued that pronunciation refers to “the production of sounds that are used to convey meaning” (1976, p.1-6). In other words, pronunciation demonstrates the way sounds are articulated and perceived within a specific language, which can enable effective communication. Proper pronunciation ensures that the speaker can be easily understood by listeners, facilitates interaction, and comprehension.

Cook (1996) went further to define pronunciation as the articulation of English sounds which is developed through consistent repetition and the correction of errors when sounds are produced inaccurately (p.1-6). Hence, it must be learned through repeated practice of such sounds, together with correcting the errors that are made during the production. This perspective views pronunciation as a set of habits acquired through repeated practice and error correction.

As a synthesis of the above definitions, they illustrate that pronunciation is not merely about producing sounds but involves a complex interplay of articulation, perception, habitual practice, and meaning conveyance. Effective pronunciation instruction integrates these aspects to enhance learners' communicative competence. Therefore, pronunciation enables learners to convey their messages and thoughts effectively; learners need to receive adequate responses from native speakers or others.

1.2. The importance of pronunciation

The primary goal of enhancing pronunciation is to be an effective communicator. Thus, focus on pronunciation improves speaking, listening, and comprehension. Hermer (2007) stated that pronunciation emphasizes sounds and shows students their points of articulation in the mouth, and draws students' attention to the correct word stress, which provides them with a helpful insight into spoken English. This added information helps them better understand and also reinforces comprehension and clarity in communication (p.183). This points to the enormous importance of pronunciation in enhancing learners' overall listening and speaking abilities.

Raimova claimed that clear pronunciation is essential for hindering misunderstandings and communication breakdowns that foster interactions with native speakers, thus significantly improving overall language ability. Furthermore, English pronunciation mastery enables learners to achieve a more neutral or native accent, which is an essential element in achieving clear, natural, and effective communication (2024, p. 201-205).

In the professional sphere, learners' ability to be understood depends primarily on pronunciation, which significantly affects their ability to develop a second language identity (Levis, 2017, pp. 1-8). As Kenworthy mentioned, learners experience severe communication restrictions when they lack proper pronunciation (1987, p.3). Simply put, learners experience

severe communication restrictions when their pronunciation are inadequate. Raimova mentioned that “pronunciation encourages learners to celebrate their progress, no matter how small” (2024, p.201). He also mentioned that cultivating a thriving learned environment demands the establishment of honest conversations alongside support for active participation and optimistic attitudes across all participants (p.205). Briefly, the main reason behind recognizing small pronunciation advancements is to inspire students' progress by actively participating while maintaining an optimistic outlook.

To sum up, the journey of language learning requires students to become experienced at pronunciation because it boosts both their speaking and listening abilities. When students develop clear pronunciation, they can better express themselves while also understanding spoken words more accurately, which helps them break down potential communication barriers. The pursuit of accurate pronunciation leads to the development of natural accents that enable people to interact with ease and fluency. When students focus on pronunciation, they create an environment that allows open communication and fundamental understanding to develop. Through pronunciation training, students build both their communication competence and their ability to create meaningful interactions.

1.3. Fluency and accuracy in pronunciation

Fluency and accuracy in pronunciation are essential components for effective spoken communication in any language. While fluency refers to the smooth, natural flow of speech, accuracy focuses on the correctness of the articulation of sounds, stress, and intonation patterns. Language fluency is characterized by the swift, seamless, and precise conversion of thoughts and communicative goals into linguistic expression. The real-time requirements of online processing guide this process to produce straightforward and concise communication patterns (Lennon, 1990, p.391). Also, Hedge stated that this concept “relates

to the production and it is normally reserved for speech. Fluency is the ability to link units of speech together with facility and without strain or inappropriate slowness or undue hesitation” (2000, p.54). This implies how naturally someone speaks a language, especially in producing the target language. In the same view, he argued that fluency involves the ability to express oneself effectively. Without this capability, communication breaks down, leading to misunderstanding and a loss of listener engagement with the speaker's message. Consequently, fluency in pronunciation is crucial for successful communication.

Language accuracy evaluates how well learners produce language that aligns with a specific correctness model. Foster and Skehan (1996) insisted that accuracy is “the freedom from errors” (pp. 299-303). It refers to the condition in which a process, product, or piece of information is entirely free of mistakes. It implies accuracy, reliability, and correctness, ensuring that the outcome meets the intended standards without faults. Moreover, Ellis (2009) defined accuracy as the ability to consistently perform without committing errors, or "avoiding mistakes," which is a vital indicator of high proficiency and command of a language. This precision may arise from a better grasp of the language's nuances, facilitating more accurate and fluent communication (p.3-18). Furthermore, it could indicate a cautious approach on the part of the speaker or writer, wherein they consciously choose to use simpler or more familiar linguistic forms to reduce the likelihood of making errors, rather than attempting more complex constructions that could lead to mistakes.

Baker and Westrup (2003) distinguished between accurate and fluent learners. They argued that a speaker demonstrating accurate language use produces grammatically sound sentences with precise vocabulary and correct pronunciation (p.7-8). Essentially, accuracy is directly linked to grammatical precision. Conversely, a fluent speaker emphasizes delivering their message effectively and naturally, without overly worrying about minor

mistakes. Fluency is centered on the smooth delivery of speech and does not necessarily indicate a complete understanding of grammar rules.

In a nutshell, accuracy and fluency are essential for successful pronunciation. The key to effective communication involves forming proper grammar and phonetic structures in speech. Achieving successful communication for EFL learners requires mastering accurate and fluent speech patterns.

1.4. Pronunciation and intelligibility

Intelligibility is essential for anyone who aims to communicate clearly and confidently with speakers of different accents and backgrounds. Gilbert stated that "Even if learners produce fluent speech with good grammar and vocabulary, poor pronunciation can still lead to misunderstanding"(2001, p. 124). Also, Crystal argued that "Pronunciation is the key to intelligibility. You can know all the grammar and vocabulary in the world, but if you don't pronounce words correctly, people may not understand you" (1995, p.138).In simpler words, like grammar, vocabulary, or any other language skill, pronunciation serves as a fundamental element that learners must develop to succeed in effective communication. No matter how good their grammar or vocabulary is? Learners who cannot identify language sounds will have restricted comprehension of spoken language.

Gilbert (2001) claimed that "Intelligibility, not perfection, is the goal" (p.130). In other terms, purposeful communication requires clarity above all else, so that others understand the message instead of pursuing perfection. The required level of grammatical correctness is not absolute, but people need to understand what you are saying and how to make sense of the information.

In the speaking context, sound production in language involves more than individual pronunciation because it involves sound combinations that generate meaningful communication. The way we connect sounds in speech, together with stress patterns, rhythm, and intonation, affect our ability to make listeners comprehend our message. To achieve proper pronunciation skills, it is necessary to observe the way sounds operate together as parts of spoken language (Gilbert, 2001, p.134). From the same point of view, Celce-Murcia et al. stated that “Pronunciation is not a frill or an add-on; it is an integral part of communication that can affect intelligibility, comprehensibility, and interpretability” (1996, p.56).

Overall, Pronunciation is more than the articulation of single sounds because it also considers how these sounds work together to form meaningful spoken language. The successful delivery of information depends on combining sound elements with proper stress patterns and intonation, and rhythm patterns. Achieving proper pronunciation means learning how to recognize single sounds as well as understand their combined role in speech for clear communication.

1.5. Features of pronunciation

Pronunciation in English includes several features that contribute to clear and effective communication. These features can be broadly categorized into **segmental** and **suprasegmental** elements.

1.5.1. Segmental Features

Segmental features involve individual speech sounds and their combinations, mainly phonemes, vowels, and consonants.

1.5.1.1 Phonemes

The central element in both fields, phonetics and phonology, is the phoneme. According to Hornby (2014), phonemes are the unique speech sounds that serve as fundamental components for constructing all valid words, or lexemes, within a given language (pp. 93-116). Moreover, John (1950) defined the phoneme as a 'small family of sounds,' where each family includes a significant sound of a language along with other related sounds (p.80). Thus, this definition emphasizes that phonemes are not merely isolated sounds, but rather components of a larger group of sounds that share similar features.

The examination of phonemes splits into two key branches, phonetics and phonology. On one hand, Phonetics studies the physical sound creation and human perception. As Roach stated that phonetics is concerned with the physical properties of speech sounds, including their articulation, acoustic, and auditory perception (2009, p.5), which means this field focuses on analyzing speech sounds independently from their specific linguistic roles.

On the other hand, Phonology analyzes the theoretical sound patterns of language. Roach asserted that Phonology focuses on how speech sounds function within a particular language and how they are organized in the mind and used to distinguish meaning (1983, p.47). As a whole, phonology investigates how these phonemes are systematically organized and interact within a language. It also explores the rules governing phoneme combinations, syllable structures, and variations across languages.

To sum up, the phoneme serves as a bridge between phonetics and phonology. While phonetics examines speech sounds physically; phonology studies their functional role in communication.

1.5.1.2 Vowels

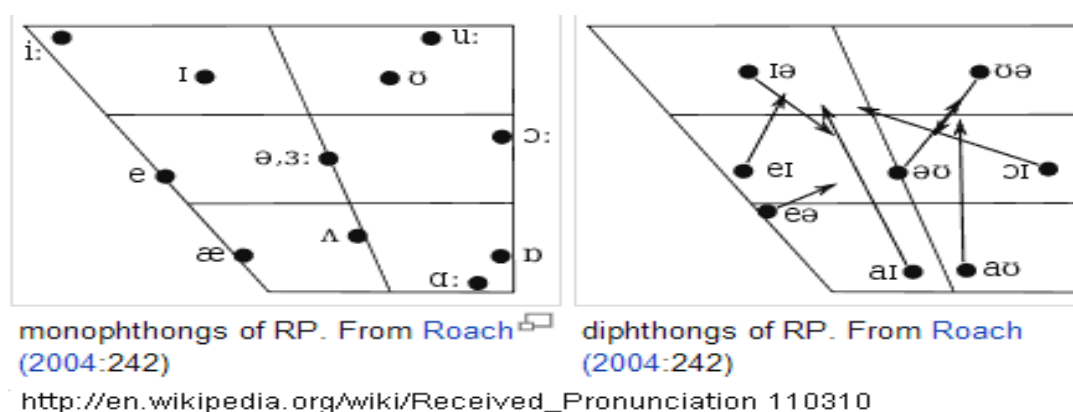
Aslam and Kak (2007) defined vowels as “voiced sounds produced with a stricture of open approximation without any obstruction, either partial or complete, in the air passage” (p.39). In addition, Ladefoged (2001) stated that “Vowels are produced without any constriction to the articulatory tract” (p.30). In essence, vowels are voiced sounds produced with an open approximation of the vocal tract, allowing air to pass freely without any partial or complete obstruction.

Surya claimed that there are two types of vowels. On one hand, there are simple vowels or monophthongs. “When a speaker assumes only a single configuration of the mouth when producing a vowel, i.e., there is no movement of the tongue, lips, or jaws, the speaker produces what is known as a simple vowel. In sum, once the appropriate position for the tongue, jaws, and lips has been set, this configuration does not alter whilst the sound is being produced”. In simple terms, monophthongs are produced when the speaker sustains a constant mouth shape through the whole sound, with no shift of the tongue, lips, or jaws. The position of these articulators stays fixed from the beginning to the end of the vowel. On the other hand, “complex vowels that involve two broad configurations of the mouth during their production (a starting configuration and an ending configuration) are known as diphthongs. These can be thought of as being created through the combination of two simple vowels”. In other terms, diphthongs are distinguished by a shift between two different mouth shapes. Learner could consider them a mixture of two simple vowels, wherein the articulators (tongue, lips, and jaws) move from one position to another inside a single syllable.

As a whole, simple vowels involve a steady, unvarying mouth shape, while diphthongs or complex vowels are created by smoothly gliding between two dissimilar mouth shapes, essentially merging the characteristics of two simple vowels within a single sound.

Roach introduced the phonetic description of English vowels, explaining how letter symbols serve as a concise way to transcribe these sounds. For instance, the vowel [i:] can be fully described as a "short, close, front, unrounded" sound, based on its articulation (1983, p.99). The figure below represents English monothongs and diphthongs.

Figure 1: *English monothongs and diphthongs*



Adapted from: http://wikipedia.org/wiki/Received_Pronunciation_110310

1.5.1.3 Consonants

According to Roach (1983), a consonant is a speech sound produced by a partial or complete constriction of the vocal tract, thereby obstructing the free flow of air during articulation (p.7). Similarly, Ladefoged (2001) defined consonants as a speech sound created by obstructing the airflow in the vocal tract (p.10).

Roach classified consonants according to the place of articulation, manner of articulation, and voicing. Roach (1983) stated that sounds in speech are categorized by their "place of articulation," which refers to where in the vocal tract the airflow is obstructed. First, Bilabial sounds, such as [p], [b], [m], and [w], are made by bringing the lips together (p.8). Then, labiodental sounds, like [f] and [v], involve the lower lip touching the upper front teeth. For dental sounds ([θ], [ð]), the tongue tip touches the upper front teeth. Moreover, Alveolar

sounds, including [s], [z], [l], [r], [t], [d], and [n], are produced with the tongue tip against the teeth-ridge (p.13). Further back, palatal sounds like [j] are made when the back of the tongue touches the hard palate. Palato-alveolar (or postalveolar) sounds, such as [ʃ], [ʒ], [tʃ], and [dʒ], are articulated with the tongue raised slightly behind the alveolar ridge towards the hard palate (p.15). Velar sounds ([k], [g], [ŋ]) occur when the back of the tongue contacts the soft palate. Even further back, uvular sounds (like Arabic [q], [X], [R], and French [R]) are produced by raising the back of the tongue to the uvula. Finally, glottal sounds, such as [h], are formed by temporarily holding and then releasing the vocal cords (p.20). Additionally, Roach argued that sounds can be classified by their "manner of articulation," which describes how the airflow is obstructed. First, stops known as plosives involve a complete blockage of the air passage, followed by an explosive release. Examples include [p], [t], [k], and their voiced counterparts [b], [d], [g] (p.33). Unlike plosives, nasal stops like [m], [n], and [ŋ] also involve a complete oral closure, but the air escapes through the nasal cavity, preventing an "explosion." English voiceless stops can be aspirated (marked with [h]), accompanied by a puff of breath, or unaspirated, without this puff (p.35). Fricatives, such as ([f], [v], [s], [z], [θ], [ð], [ʃ], [ʒ], [h]), are produced by a partial obstruction of the air passage, creating friction (p. 40). Affricates, such as [tʃ], [dʒ], are a combination of a stop and a fricative, beginning with a complete obstruction that is then gradually released, causing friction (p.42). Nasals ([m], [n], [ŋ]) are characterized by a complete oral obstruction while the soft palate is lowered, allowing air to escape through the nose (p.45). Finally, liquids are either lateral or non-lateral. The lateral consonant [l] involves a partial closure at the alveolar ridge, with air escaping along the sides of the tongue. In contrast, the non-lateral liquid [r] involves a partial obstruction by raising the tongue tip to the alveolar ridge (p.47-48).

Besides that, Roach (1983) mentioned that the vibration of the vocal cords determines whether a sound is voiced or voiceless. Voiced sounds are produced when the airstream from

the lungs causes the vocal cords to vibrate, as can be felt by placing a hand on the ears while pronouncing sounds like [v], [z], [d], and [g]. Conversely, voiceless sounds, such as [θ], [f], [s], [t], [p], and [k], are produced when the air flows freely through the glottis without causing vocal cord vibration, and no vibration will be felt. This voiced/voiceless distinction is crucial in language, as it allows us to differentiate between minimal pairs of words, such as "two" [tu:] (voiceless initial consonant) and "do" [du:] (voiced initial consonant) (p.22-23).

1.5.2 Suprasegmental features

Suprasegmental Features govern how sounds are organized and emphasized in speech, mainly their function within a given language.

1.5.2.1 Syllable

According to Hjelmslev (1939), a syllable is a unit of pronunciation that contains exactly one stressed vowel sound (pp. 266-272). Similarly, Kenstowicz (1994) said that syllable is not a sound, but an abstract unit of the prosodic organization through which language expresses much of its phonology" (p. 250-255). From Roach's (1983) perspective, a syllable has three main parts: the onset, the nucleus, and the coda. The onset is the beginning sound(s) of a syllable, which can be a single consonant or a group of consonants. If a syllable starts with a vowel, which means there is no onset (it's called a "zero onset"). Also, the nucleus is usually the central part of the syllable and is typically a vowel. The coda is the final sound(s) of the syllable. For example, in the word "big" ([bɪg]), "b" is the onset, "i" is the nucleus, and "g" is the coda. Overall, the phonetic theory centers on the physical traits of speech. As an illustration, vowels are usually more prominent compared to consonants, and this prominence helps to shape the middle of a syllable. However, the phonological theory,

conversely, defines syllables based on the rules and patterns of sound pairings in a particular language.

1.5.2.2. Stress

Nunan described stress as “the emphasis we give to individual syllables within a word as well as the emphasis given to words within utterances” (2015, p.96). Similarly, John (1950) argued that “stress is the relative emphasis given to a syllable in speech which may be realized by increased loudness, length, and pitch, and by a greater muscular effort” (p.356). (These two definitions demonstrate stress as a functional instrument positioned on a syllable within a word; it entails physical elements during speech, and this accentuation aids in differentiating meaning and rhythm in speech.

Stress in linguistics refers to the relative emphasis given to particular syllables, both within a word and in a sentence. There are two primary types of stress to understand: Word Stress and Sentence Stress. Richard and Schmidt (2010) asserted that both stressed and unstressed syllables are characteristics of word stress, which occurs when a syllable is spoken with greater power and energy (p.560). The degree of force used when pronouncing a syllable is referred to as word stress (Crystal, 2005, p. 454). Simply put, word stress refers to the way certain syllables within a word are pronounced with greater emphasis than others. When we say a word, one part stands out because it is emphasized more strongly, making it more noticeable to listeners. This means that some syllables are spoken with more effort or intensity, making them more prominent than the others, typically through greater loudness, duration, or pitch.

Giegerich (1983) stated that sentence stress is “a domain that extends beyond the simple words and their accents, covering prominence relations within lexical compounds and syntactic phrases (p.1-28). Additionally, Ladefoged (1967) declared that sentence stress is

the way learners stress words in a sentence, giving our speech rhythm and helping them express what they mean and how they feel (p.63). In a nutshell, the authors emphasize the role of word stress in spoken language as more than just a technical feature. It provides a natural rhythm (melody) to the entire phrase and structure that is pronounced, indicating which words in a sentence are stressed. By stressing certain words, speakers can highlight important information, show contrast, or express emotions like surprise, anger, and excitement.

Stress is important for several reasons. O'Connor declared that "If you stress the wrong syllable, it spoils the shape of the word for an English hearer and he may have difficulty in recognizing the word" (1980, p.91). In other words, using the wrong stress in a word can make it sound unfamiliar to the receivers, and they may misunderstand the word. According to Ladefoged (2001) one of the most crucial aspects of pronunciation is stress, which can impact both meaning and intelligibility (p.268). For instance, in English emphasis can differentiate between nouns and verbs (e.g., record as a noun when you stress the first syllable and record as a verb when you stress the second syllable).

1.5.2.3. Rhythm

In English, rhythm denotes the pattern of stressed and unstressed syllables in sentences (Al-Hajeid et al., 2022, p.1-9). Stressed syllables are typically longer, louder, and higher in pitch, while unstressed ones are shorter, quieter, and lower in pitch. Not only that, Roach (1983) explained rhythm as the measurement of the time between stressed syllables (the strong beats) in spoken English; he expected the timing to be regular, like a steady rhythm.

Maintaining rhythm in spoken English is crucial for clear communication; speakers often accomplish this through various methods, such as vowel reduction, where less important words are placed on grammatical words like pronouns (Isaacs & Trofimovich, 2012, p.1-24).

Thus, these findings demonstrate that the rhythm of a second-language (L2) speaker can significantly impact how readily they are understood. Furthermore, Chen and Zecher (2011) researched different aspects of speech rhythm and discovered that variations in vowel, consonant, and syllable length have a slight but noticeable correlation with how proficient a speaker sounds (p.1861-1864).

1.5.2.4. Intonation

Wells stated that “Intonation is the use of pitch in speech for linguistic objectives, it is the linguistically Significant use of the variation in pitch level of the voice” (2006, p.145). As well, Crystal argued that “Intonation helps to structure speech: it tells us when we come to the end of the sentence, whether a sentence is a statement or a question, and whether we are surprised or doubtful” (2005, p.286). This means that intonation is the melody of speech, illustrating how the pitch of the voice goes up and down to communicate meaning beyond the exact words uttered. It's a key element in expressing feelings, attitudes, and intentions, such as astonishment, rage, or thankfulness. For example, a rising pitch at the end of a sentence frequently signals a question, whereas a falling pitch implies a statement. Intonation also offers structure to speech by emphasizing crucial points and organizing information.

Kenworthy (1987) emphasized that intonation is a critical component of intelligibility, as it conveys a speaker's intentions. Through variations in pitch, a speaker can signal whether they are asking a question (seeking information or verification), searching for consensus, or merely stating something as a fact or shared knowledge. Although incorrect pronunciation of individual sounds can cause confusion, using an inappropriate intonation pattern can be equally damaging to comprehension (pp. 4-9).

1.5.2.5. Connected speech

Connected speech refers to the way words blend in spoken language, creating a smoother and more natural flow through altered pronunciation. It encompasses all methods in which sounds are linked, assimilated, and omitted.

1.5.2.4.1. Linking

Linking is how people easily transmit from one word to the next when speaking naturally. They commonly add or retain consonant sounds at the spots where words meet, making the speech flow more readily (Roach, 2009, p.110). As portrayed by Burns (2003), it is a key attribute of connected speech that occurs when the concluding sound of a word is joined to the initial sound of the following word; this fosters a smooth and continuous flow in spoken language (p 87). To be more clear, linking assists speakers in forming smooth and natural transitions between words during speech; it involves consonant to vowel linking, such as [an American actor], consonant to consonant linking as in [four days], and vowel to vowel linking like [very old].

1.5.2.4.2. Elision

According to Roach, "Elision concerns the omission of a sound segment which would be present in the deliberate pronunciation of a word or phrase" (2009, p.113). As Crystal claims, elision alludes to the omission of a sound or syllables during speech, particularly when speaking rapidly (2003, p.55). In pronunciation, elision is the leaving out of sounds or syllables in the manner learners' utter words or phrases rapidly; for instance, rather than [fish and chips], learners might say [fish n chip], and the word "and" loses its [d]. Elision often becomes a standard part of how we pronounce certain combinations of words over time, making it somewhat quicker.

1.5.2.4.3. Assimilation

Kelly (2000) defined assimilation as "the process by which sounds change to resemble nearby sounds, generally occurring at word boundaries in fluent speech" (p. 108). Thus, assimilation can affect consonants by altering their place of articulation, making them more similar to nearby sounds. For instance, in the phrase "good boy," the /d/ in "good" may be pronounced more like /b/ due to the influence of the following /b/ sound, resulting in ["gab gab"]. Such changes help reduce the effort needed for articulation and enhance the natural flow of speech.

To sum up, applying the three key aspects of connected speech can greatly improve both listening comprehension and speaking fluency in English. By becoming more familiar with these features English learners can sound more natural and confident and be better understood by listeners in real life conversations.

1.6. Teaching pronunciation

Teaching English pronunciation presents several challenges. Educators frequently struggle with vague guidelines and encounter inconsistent methods for practicing pronunciation. There is currently no universally accepted systematic approach that clarifies what to teach or how to implement instruction effectively. Consequently, pronunciation tends to receive less focus in language education, leaving many teachers uncertain about how to integrate it into their classes.

Teachers can support children's pronunciation with various strategies and techniques (Harmer, 2001, p. 185). Fraser (2000) emphasized that educators need access to courses and resources to enhance their pronunciation instruction. He argued that language education research should focus more on effective teaching methodologies rather than the importance

of English pronunciation instruction (p.103). Furthermore, Hancock (2012) stated that, while it is essential to emphasize pronunciation features in EFL, teachers should not consider this core set as fixed or unchangeable. Instead, they must exercise their judgment and modify their teaching approach according to the distinct needs and circumstances of their learners (p 97).

Westwood et al. proposed guidelines to help teachers plan and design oral activities in their classrooms. First, teachers need to choose course content and establish objectives that align with students' needs and learning goals. Second, at the start of instruction, educators should aim to create a comfortable and motivating atmosphere by fostering positivity and encouragement. Third, materials should be introduced gradually, proceeding only when most learners grasp the previous concepts. Fourth, teachers should utilize feedback and implement reward systems. Finally, collaborating in smaller groups and regularly varying the activities are advised (as cited in Tahir, 2013, pp. 13–14).

The main aim of pronunciation instructions is not limited to making learners have perfect pronunciation; however, the real purpose is effective communication, which focuses more on intelligibility, enhancing their speaking proficiency, and how they perceive the sounds of English pronunciation, including individual sounds as well as larger speech components like syllables, stress, and rhythm. Unfortunately, pronunciation instructions are sometimes ignored in English language teaching (Poorhouse Nilekani, 2016). Morley (1994) stated that understandable pronunciation is a main objective of pronunciation instruction. It is a necessary component of communicative competence (p. 64-90).

In conclusion, given the significance of pronunciation in language teaching, Harmer (2001) asserted that teaching pronunciation not only increases students' awareness of

different sounds and sound features but also significantly improves their speaking skills (p.183).

1.7. Approaches to teach pronunciation

An approach is a set of theories concerning the nature of language and how it is learned, which form the foundation for the methods and guidelines used in language teaching (Richards and Rodgers, 2001, p. 161). The intuitive approach, the analytic linguistic approach, the integrative approach, and the deductive approach are the major traditional theories that influence pronunciation using different tools during language learning. In contrast, there are many modern approaches for teachers to choose from, such as communicative, inductive, and phonological awareness approaches.

1.7.1. Intuitive and imitative approach

In the intuitive-imitative approach, learners develop accurate pronunciation by attentively listening to native speakers and mimicking their speech, without receiving direct or formal instruction (Lee, 2008, pp. 21-25). Behzadi and Fahimniya (2014) asserted that this approach allows learners to acquire pronunciation by absorbing and imitating the rhythms and sounds of the target language, naturally reaching an acceptable level without the need for direct teaching (p.263-270). The key tools often utilized in this method are songs and drills. Songs serve as a more engaging and effective way to master pronunciation, immersing students in a continuous flow of natural speech that makes listening and practice enjoyable. Singing along with English songs helps students improve their pronunciation while becoming familiar with the language's rhythm, stress, and intonation (Sihvonen et al., 2020, p. 2272-2287). Moreover, songs can lessen learners' anxiety regarding their pronunciation, promoting greater confidence in speaking English. Also, Tsuraya (2020) argued that the Intuitive-Imitative Approach is effective in teaching pronunciation because it mirrors how

individuals naturally acquire their first language. So, this method emphasizes experiential learning, where learners are exposed to authentic language models (like native speakers or recordings) and then encouraged to mimic their pronunciation patterns (P.77-88). In addition,” In the imitative approach, drills used as a primary method for getting students to imitate native speakers’ pronunciation, focusing on form and accuracy rather than meaning” (Richards and Theodore,2001, p.45). In other terms, the imitative approach is a way of teaching pronunciation where students practice by imitating how native speakers sound. This method uses drills (repeated practice of specific sounds or sentences) to help learners focus on saying words correctly. The main goal is to get the pronunciation right and accurate, rather than understanding the meaning of what they are saying. So, students spend more time repeating and perfecting sounds than thinking about what the words mean.

1.7.2. Analytic-Linguistic approach

The analytic-linguistic approach emphasizes the necessity of clear pronunciation instruction in second language (L2) learning. Participants received direct information about pronunciation, including the phonetic alphabet, articulatory descriptions, and vocal charts. (Hashemian and Fadaei, 2011, p. 969-976) To clarify, the analytic-linguistic approach to pronunciation teaching in second language (L2) learning is based on the idea that explicit instruction significantly aids learners. Unlike relying on imitation and mere exposure, this method provides learners with clear, detailed explanations of how the sound in the target language is articulated. Practically, this involves introducing students to tools like the phonetic alphabet to visually differentiate between various sounds, as well as articulatory descriptions that explain how to position the tongue, lips, and other speech organs to produce specific sounds. Vocal charts and diagrams of the vocal tract are frequently utilized to demonstrate these articulation processes. By making the mechanics of pronunciation visible

and comprehensible, the analytic-linguistic approach fosters learners' conscious awareness of the distinctions between their first language and the target language.

1.7.3. Integrative Approach

An integrated curriculum unites various subjects, illustrating the relationships between knowledge and skills from different areas. Rather than teaching each subject in isolation, this method organizes education around wider themes or real-world problems, enhancing its relevance and reflecting real-life applications. It motivates students to establish connections across fields, facilitating a more holistic, engaging, and pertinent learning experience (Beane, 1997, p.12). Also, Avery argued that Effective language teaching necessitates the continuous integration of pronunciation practice into every aspect of the curriculum, with consistent reinforcement in all lessons (p.152). Furthermore, Levis and Grant (2003) asserted that “Pronunciation instruction needs to be integrated with broader-level communicative activities in which speakers and listeners engage in meaningful communication ”(p.13-19). In other words, integrating pronunciation instruction effectively means moving beyond isolated drills and incorporating it into larger communicative tasks. This approach allows speakers and listeners to apply pronunciation skills naturally while engaging in genuine, meaningful exchanges, thereby fostering more coherent and cohesive communication.

1.7.4. Deductive approach

In the deductive approach, learners are presented with pronunciation rules explicitly at the beginning of the lesson, followed by examples and practice activities. This teacher-centered method suits learners who appreciate clear guidance and structured input (CelCe-Murcia et al., 2010, p. 115). Rivers and Timperley (1978) describe the deductive approach as a traditional teaching method that introduces grammatical rules or structures to students at the outset. This approach can be particularly efficient and time-saving, especially in

monolingual classrooms (p.342). In summary, this method starts by articulating the rule and then offers examples that illustrate its practical application. It emphasizes first grasping the rule, followed by applying it through specific cases. This deductive approach ensures that learners initially get a straightforward explanation of a grammar rule, typically paired with examples demonstrating its function in various contexts.

1.7.5. Communicative approach

The Communicative Approach is based on the idea that effective language learning happens when learners participate in meaningful communication (Richards and Rodgers, 2001, p. 161). According to Sauvignon, Communicative Language Teaching is learner-centered, highlighting the importance of practical experiences in second language education (1991, p. 261-277). In summary, the Communicative Approach emphasizes meaningful communication and real-world experiences to enhance effective language learning, stressing the active involvement of the learner in the process.

The main tools in the communicative approach utilize various techniques such as role plays, interviews, collaborative group activities, information gap exercises, games, problem-solving tasks, and authentic materials, all aimed at fostering genuine communication. According to Littlewood (1981), information-gap activities, where each participant has unique information that others do not, are essential methods in Communicative Language Teaching (CLT) because they facilitate authentic negotiation of meaning (p.62).

1.7.6. Inductive approach

The inductive teaching approach for pronunciation focuses on learners discovering pronunciation patterns through examples rather than receiving direct rule explanations. This method allows learners to infer rules from the presented data, fostering greater cognitive

engagement and enhancing their independence in language acquisition (CelCe-Murcia, 2010, p. 120). In simpler terms, the inductive approach prompts students to deduce grammar rules independently by examining examples. With teacher support, students can identify their errors. Some researchers refer to this technique as guided induction (Cerezo et al., 2016; Leow, 2019) or guided inductive instruction (Lai et al., 2020; Moranski & Zalbidea, 2022).

1.7.7. Phonological awareness approach

Phonemic awareness training is an essential method in teaching pronunciation, phonemes, which are the smallest sound units in a language. Yopp (1992) stated that phonemic awareness is a fundamental skill that underpins precise pronunciation and comprehensive language development (p.23). In simple terms, this training includes various exercises, this includes tasks like recognizing sounds in words, segmenting and blending phonemes, and practicing minimal pairs (for instance, distinguishing "bit" from "beat"). By focusing on phonemic awareness, learners enhance their capacity to produce the sounds of the target language and improve their listening skills. Research indicates that phonemic awareness training is especially beneficial for second language learners and young children, as it boosts their ability to detect sound distinctions that may not be present in their native language. This method not only enhances pronunciation but also supports improved reading and spelling skills, making it an essential element of language acquisition.

The Prosodic Awareness Approach represents a form of phonological awareness that highlights the roles of stress, rhythm, and intonation in pronunciation. It aids learners in understanding how these elements impact meaning in spoken language (Gilbert, 2008, p.). Specifically, this approach emphasizes how stress patterns influence word pronunciation, how rhythm contributes to the fluidity of speech, and how intonation expresses emotions

and intent. By concentrating on these components, learners cultivate a more natural and comprehensible pronunciation, which minimizes misunderstandings during communication.

Yopp and Yopp asserted that instruction in phonological awareness generally involves activities such as rhyming, segmenting words into syllables, merging initial sounds with the remainder of the word, recognizing individual phonemes, and engaging in sound manipulation exercises. These activities are crucial for developing essential reading skills (2009, p.15).

As a whole, in this section, the deductive, imitative, analytic-linguistic, and integrative methods each provide unique strategies for teaching and learning languages. The deductive method prioritizes rule-based instruction, giving learners clear grammar explanations prior to practice. The imitative method emphasizes repetition and mimicry, assisting learners in internalizing correct language patterns. In addition, the analytic-linguistic method encourages understanding through the analysis of language structures, prompting learners to think critically about both form and function. Lastly, the integrative method seeks to blend different skills and approaches, nurturing a more holistic and communicative language experience. Collectively, these methods illustrate the various ways language can be taught and learned, each adding valuable perspectives to effective language instruction. However, the communicative, inductive, and phonological awareness approaches each play a vital role in language learning. The communicative approach emphasizes real-life interaction and meaningful use of language, while the inductive approach encourages learners to discover rules through guided examples, fostering deeper understanding. Meanwhile, the phonological awareness approach builds a strong foundation by helping learners recognize and manipulate sounds in spoken language. Together, these methods complement each other, creating a comprehensive and effective language learning experience.

1.8. Factors affecting EFL learners' pronunciation

Numerous studies in Foreign Language Learning have explored the difficulties that hinder foreign language learners from achieving native-like pronunciation (O'Connor, 2003; Yule, 2003). According to Kenworthy (1988), "pronunciation learning is greatly influenced by things such as the native language, age, exposure level, phonetic ability, attitude and identity, motivation, and concern for good pronunciation. (p.4-9). The focus in this part is mainly put on the basic factors that affect EFL students' pronunciation, which are: Mother tongue interference, Age, Exposure to listening skills, Feedback, Motivation and attitude.

1.8.1. Mother tongue interference

Benson (2002) stated that children who are impelled to learn a second or foreign language often struggle academically or fail to gain basic literacy due to interference from their mother tongue and comprehension problems (304). Additionally, Saville-Troike (2006) depicted mother tongue interference as the process by which learners utilize the linguistic and communicative resources of their native language while endeavoring to speak in a second language. This can be advantageous because it simplifies language acquisition; however, it can also lead to errors and misunderstandings. To clarify, mother tongue interference has both positive and negative effects on language learning, and students may face challenges when their native language influences their understanding and performance, causing mistakes and confusion, or it can assist learners in understanding faster.

Nowokedi (2023) reported that mother tongue interference extends beyond its well-known effects on language acquisition and pronunciation, significantly influencing students' overall academic performance, especially in subjects that require strong language skills (p.673-684). Simply, the influence of a student's mother tongue can disrupt the natural

progression of learning, leading to feelings of frustration and disengagement. As students struggle with the complexities of English while simultaneously battling the persistent interference of their native language, their confidence in academic settings can significantly diminish.

1.8.2. Motivation and attitude

According to Gardner, “Motivation refers to the combination of effort plus desire to achieve the goal of learning the language, plus a favorable attitude toward learning the language” (1985, p.10). Therefore, motivation is what pushes a person to study a language. It’s not merely about desiring to learn, but also about putting in the work and maintaining a positive outlook on the process. Someone who genuinely wishes to accomplish their language goals and approaches studying with dedication and pleasure is more likely to succeed.

Masgoret and Gardner stated that attitude toward the learning situation reflects how a person feels and responds to the environment and conditions in which the language is being taught (2003, p.172-173). Thus, attitude toward the learning situation describes a person's immediate emotional and behavioral response to anything related to the specific environment where language is taught. This encompasses their feelings, reactions, and overall disposition toward the classroom, teaching methods, materials used, and any other elements within that immediate learning context.

Moreover, Krashen (1981) argued that “a positive attitude towards the target language and its speakers contributes to better pronunciation because learners are more willing to adopt the accent and speech patterns” (p.66). Similarly, Gilakjani et al., (2016) stated that “Highly motivated learners are likely to pay more attention to pronunciation and to practice more, which can lead to more accurate and native-like pronunciation” (p.9-16). So, a positive

attitude toward the target language and its speakers fosters a greater willingness in learners to adopt the accent and speech patterns, which, combined with high motivation, encourage more diligent attention to pronunciation and increased practice, ultimately leading to more accurate and nativelike speech.

1.8.3. Age

Age uniquely influences pronunciation in language learning; adults rarely achieve native-like pronunciation regardless of the effort they put in (Scovel, 1988, p. 66). Moreover, Scovel (2000) argued that adults face difficulty in mastering native-like pronunciation, which strongly supports the theory of a biological window called the Critical Period during language learning, which happens naturally (p.213-223). Simply put, Scovel discussed the Critical Period Hypothesis (CPH) and how pronunciation stands out as the most clearly influenced by learners' age. Young learners can often achieve native-like pronunciation; however, adults, with significant practice, rarely sound indistinguishable from native speakers in their accent and intonation. As Lenneberg stated, "Language acquisition is biologically linked to age. After puberty, the brain loses its plasticity, making it difficult to acquire a native like accent" (1967, p.230). This means that age matters, especially regarding pronunciation. The earlier someone learns a language, the more natural they will sound. After puberty, the brain becomes less flexible. Adults can still learn vocabulary and grammar, but they do not sound as much like native speakers.

1.8.4. Exposure to listening skills

Extensive listening involves dedicating considerable time to hearing audio materials, where the main objective is to understand the general sense instead of concentrating on every specific detail. Individuals participate in this style of listening for various reasons, such as developing their language abilities or simply appreciating the content (Rost,2021, p.193).

Listening and pronunciation are closely linked—both in how students acquire these skills and how they process and improve them jointly at a neurological level. As the learner speaks, the part of the brain responsible for action (the motor cortex) receives signals from the part that processes sound (the auditory cortex), directing our mouth and facial muscles to generate the correct sounds (Rost,2021, p.30).

According to CelCe-Murcia et al. (1996), listening functions as the fundamental basis for speaking. When learners hear accurate pronunciation repeatedly, it aids them in developing precise pronunciation skills. Without frequent exposure to correct sounds, it becomes challenging for them to speak correctly themselves (p.357). Exposure to genuine natural speech is crucial because it assists learners in absorbing the rhythms, intonation, and sounds of the language they're studying (Brown,2007, p.30-36).

1.8.5. Feedback

Levis asserted that "Corrective feedback in pronunciation helps learners develop phonological awareness and refine their speech production" (2005, p.379-397). Similarly, CelCe-Murcia et al. (2010) asserted that giving feedback that is both prompt and explicit assists learners in recognizing the difference between how they pronounce words and the correct way, which is crucial for making headway (p.153). In other words, immediate and specific feedback is important because it aids learners in promptly recognizing the difference between how they are pronouncing words and the correct way to say them. When feedback is given right away and concentrates on particular sounds or errors, learners can better understand what needs to be corrected. This clear guidance makes it simpler for there to adjust thempronunciation and get closer to the target accent or standard, leading to quicker and more effective improvement.

To sum up, pronunciation in EFL is influenced by a variety of interconnected factors. Age plays a significant role, as younger learners often acquire pronunciation more easily due to greater neural plasticity. L1 interference can also pose challenges, as the phonological system of the native language may affect the ability to produce certain English sounds. Additionally, motivation and attitude are crucial; highly motivated students maintain a positive attitude toward learning English, are more likely to put effort into improving their pronunciation. Lastly, exposure to listening skills greatly enhances learners' ability to perceive and reproduce accurate pronunciation.

Conclusion

In conclusion, pronunciation extends beyond the basic articulation of individual sounds; it encompasses the complex arrangement of segmental features (vowels and consonants) and suprasegmental elements (stress, intonation, rhythm) that imbue spoken English with meaning and authenticity. Its importance in English as a Foreign Language (EFL) cannot be overstated, as intelligible pronunciation underpins effective communication, fostering learners' confidence and facilitating social interaction. While accuracy and fluency are crucial aspects, the ultimate goal is often intelligibility – the ability to be understood by listeners. Various factors influence a learner's pronunciation development, including the interference of their native language, the extent of their exposure to listening skills, their motivation and attitude towards learning, the quality of feedback received, and even their age. Effective pronunciation instruction typically involves a multifaceted approach, drawing upon methods such as phonetics instruction, mimicry, minimal pair practice, and the use of the appropriate tools, all aimed at raising awareness of English sounds and their production, ultimately enhancing learners' communicative competence.

Chapter two

AI Technologies

Introduction

Artificial Intelligence (AI) is a rapidly evolving field that enables machines to mimic human intelligence, including learning, reasoning, and problem-solving capabilities. Over the years, AI has profoundly impacted various sectors, including education and language learning. In the educational landscape, AI technologies have transformed traditional teaching methods by offering personalized, adaptive learning experiences tailored to individual needs. This shift is particularly evident in language learning, where AI tools facilitate captivating environments and real-time feedback, enhancing learners' grammar, vocabulary, and pronunciation, mainly English Foreign Language pronunciation. Thus, AI tools are crucial in improving pronunciation by providing learners with accurate models, identifying errors, and offering corrective feedback.

This chapter takes a closer look at Artificial Intelligence in education, starting with what AI is and how it's evolved in language learning, discussing the different AI tools used, and the challenges that come with them. It explores how AI helps improve pronunciation for English Foreign Language learners. Finally, it highlights the advantages of using AI for EFL students, such as personalized feedback and faster progress in pronunciation.

2.1. Historical overview of AI in foreign language learning

Artificial intelligence (AI) officially began as a scientific field in 1956 when John McCarthy introduced the term at the Dartmouth Conference, marking the start of focused AI research (IBM, n.d.). In the 1960s, Joseph Weizenbaum created one of the first AI programs called ELIZA. This program used pattern matching to simulate conversation, which made

users feel as if the machine understood human language, even though it did not truly comprehend it (Weizenbaum, 1966). Although ELIZA was not designed for teaching, it showed the potential of AI in human-computer interaction and influenced later developments in language education.

Furthermore, the use of AI in foreign language learning (FLL) became more noticeable towards the late 20th century, as researchers began creating intelligent tutoring systems (ITS) designed to offer personalized learning experiences. Dodigovic (2005) studied how AI could help second language learners by identifying their mistakes and giving specific feedback. This early use of AI demonstrated its ability to support individualized learning paths and promote learner independence. However, despite these advances, Kulik and Fletcher found that language learning systems were still rarely included in broader assessments of ITS effectiveness, indicating that AI's role in FLL was still limited at that time (Winter-Verlag, 2025).

In recent years, the role of AI in language learning has expanded significantly. Danesi (2025) explored both the theoretical and practical applications of AI in foreign language learning, emphasizing how AI-powered tools enhanced learner engagement and motivation. Key technologies like natural language processing (NLP) and adaptive learning systems became essential parts of AI-based platforms. Additionally, Abdalgane and Othman (2024) conducted a systematic review that revealed increasing academic interest in AI's role in English as a Foreign Language (EFL) teaching. Their research highlighted the rise of tools such as AI writing assistants and automatic assessment technologies, which benefited both students and teachers.

Moreover, AI-powered applications like Duolingo introduced features such as chatbots and personalized feedback, enabling learners to practice interactively and receive support

tailored to their progress. According to an article in *The New Yorker* (2023), Duolingo's use of AI marked a major change in digital language education, showing how AI influenced modern language learning methods. These innovations highlighted the transformative impact of AI on foreign language education, making it more adaptive, accessible, and effective.

The advent of artificial intelligence (AI) has profoundly impacted language learning, offering learners personalized and engaging experiences that foster motivation and engagement, as noted by Ebadi and Amini (2022). Moreover, AI speech evaluation tools have been instrumental in enhancing speaking abilities, as demonstrated by Zou et al. (2023a). Additionally, AI writing tools have been shown to improve writing skills, as highlighted by Alharbi (2023). Overall, AI is revolutionizing language education, shaping its future through dynamic, tailored learning environments, as discussed by Zhu and Wang (2025). Consequently, the integration of AI in language learning is not only enhancing educational outcomes but also transforming the way we approach language instruction.

2.2. Definition of AI

Artificial Intelligence (AI) is defined as a field that combines science and engineering to create intelligent machines, especially computer programs (McCarthy et al., 1955, p. 12). Essentially, AI studies how agents can sense their surroundings and act on that information, as described by Russell and Norvig (2010, p. 2).

However, AI is a domain of research that concentrates on programming machines to perform tasks typically requiring human intelligence, as stated by Minsky (1985, p.17). Consequently, this involves capabilities such as learning and problem-solving. Furthermore, according to Turing (1950, p. 433), machines can perceive and act upon their surroundings, foundational to AI's goal of replicating human-like intelligence.

Additionally, Artificial Intelligence (AI) is an area of study that focuses on the calculations that allow machines to perceive, reason, and act, as noted by Winston (1992, p. 5). In short, AI involves studying how machines can think and act like humans. Importantly, according to Winston, AI is about making machines intelligent through computation. As a result, this understanding has led to many AI applications, such as machine learning and language processing.

Finally, according to Rich (1983, p. 3), Artificial Intelligence (AI) is a discipline that explores how to enable computers to perform tasks currently executed more effectively by humans. In essence, this involves creating intelligent machines, a concept outlined in Nilsson's work (1998, p. 13), which defines intelligence as the ability to function appropriately in one's environment. Consequently, AI seeks to replicate human-like capabilities in computational systems.

2.3. Types of AI pronunciation technologies

In recent years, technology has made significant progress in helping people improve their language pronunciation. Artificial intelligence (AI), machine learning, and natural language processing (NLP) are now being used to analyze and enhance how we speak. These tools offer personalized feedback and interactive learning experiences, making it easier for learners to develop their spoken language skills. Here are the main types:

2.3.1. Speech recognition technology

Rabiner and Juang's groundbreaking study laid the foundation for modern speech recognition by defining it as the process of converting spoken words into text using computational algorithms (Rabiner & Juang, 1993). However, Speech recognition has come a long way, evolving from rule-based systems to machine learning technologies. According

to Huang, Baker, and Reddy, it involves extracting features from speech signals and decoding messages using machine learning (Huang et al., 2014).

In recent years, technology has become more intuitive, allowing us to interact with machines using our voices. As Fei-Fei Li and Kai-Fu Lee pointed out, this is made possible by AI-driven speech recognition, which enables real-time conversations between humans and machines (Li & Lee, 2019). According to their analysis, tech giants like Google, Amazon, and Microsoft have integrated this technology into assistants like Alexa and Siri. These tools use advanced computer techniques to create seamless interactions, which is why voice-controlled tech is becoming more popular across different industries. For example, in healthcare, speech recognition helps Doctors document patient information more efficiently.

In conclusion, speech recognition technology has revolutionized how humans interact with machines. It's no longer just about converting spoken words into text; it's about creating seamless conversations between humans and devices. From voice assistants like Alexa to transcription services, speech recognition has become an integral part of our daily lives. This technology has evolved significantly, from early statistical models to sophisticated deep learning systems, improving accuracy and efficiency. As it continues to advance, speech recognition will play a crucial role in bridging language barriers and enhancing communication across cultures and industries.

2.3.2 Natural language processing

Natural Language Processing (NLP) is defined as a tool within artificial intelligence that enables machines to analyze, interpret, and generate human language, as explained by Gillis, Lutkevich, and Burns (2023). Furthermore, Rapid Innovation (2023) described NLP as a computational tool that applies linguistic rules and statistical models to process both spoken and written language, which makes it especially valuable in educational technologies.

Importantly, this tool gained recognition for bridging the gap between human communication and machine understanding. Consequently, NLP became an essential component in the development of intelligent systems that assisted learners in various aspects of language acquisition.

In the area of pronunciation, Natural Language Processing (NLP) is used as a tool to evaluate and enhance learners' spoken language. By integrating automatic speech recognition (ASR), NLP analyzes learners' pronunciation and compares it to native speech models, which helps identify phonetic deviations. For example, Mak et al. (2003) developed PLASER, a pronunciation learning system that uses ASR to provide specific feedback on learners' speech. Through this tool, learners receive real-time responses about their errors, enabling immediate corrections and supporting improvements in phonological awareness. Moreover, recent advancements combine NLP with reinforcement learning and deep neural networks to deliver personalized pronunciation correction, adapting feedback to individual learner profiles and further increasing the effectiveness of pronunciation training (Science Direct, 2025).

Furthermore, researchers found that NLP-based pronunciation tools are effective in improving both accuracy and learner engagement. For instance, recent studies demonstrated that learners who used NLP-driven systems showed significant gains in motivation, confidence, and performance compared to those using traditional methods. These tools enabled better phoneme recognition, improved intonation control, and enhanced overall oral proficiency by providing objective and consistent evaluations that helped identify pronunciation issues not easily detected by human instructors. However, as noted by earlier scholars such as Eskenazi (1999), some limitations remain, including the system's sensitivity to accent variation and occasional misjudgment of correct pronunciations, which highlights

the ongoing need for human oversight alongside technological support. To sum up, NLP is not only a functional tool but also a transformative one, reshaping how pronunciation and language skills are taught and acquired in modern classrooms.

2.3.3. Machine learning and adaptive learning systems

Machine Learning (ML) is defined as a tool that allows computer systems to learn from data and improve performance over time without explicit programming, as explained by Gillis, Lutkevich, and Burns (2023). In education, researchers found that ML enables systems to process learner data, recognize patterns, and provide predictive feedback, leading to more personalized and effective instruction. Adaptive Learning Systems (ALS) are tools that apply ML techniques to adjust learning experiences based on individual student performance, as noted by Fiveable (n.d.). These tools personalize content delivery, making instruction more efficient and responsive to learner needs by analyzing performance data, recommending resources, and adapting activities in real time. Overall, ML-powered tools have transformed education by supporting early intervention, automating feedback, and creating adaptive, student-centered learning environments.

Researchers found that machine learning (ML)-based tools significantly improve pronunciation by evaluating spoken language, detecting errors, and providing real-time corrective feedback (Talkpal, 2023). Adaptive systems track learner progress and adjust feedback or task difficulty to address issues like misarticulation and stress patterns (Frontiers, 2021). These tools offer continuous, personalized support, making pronunciation practice more effective and helping learners build fluency and confidence.

2.3.4. Text-to-speech and speech synthesis

Text-to-Speech (TTS) synthesis is defined as a tool that converts written text into spoken

words, allowing machines to simulate human speech, as described by Gillis, Lutkevich, and Burns (2023). Furthermore, Allen, Hunnicutt, and Klatt (1987) explained that TTS technologies typically include a front-end that analyzes and converts text into phonetic representations, and a back-end that transforms these representations into audible speech using synthesized voices. In addition, recent research emphasized that TTS tools rely on computational methods such as text preprocessing, linguistic analysis, and sound generation to produce natural-sounding speech for applications in education and accessibility.

Recently, there have been significant advancements in text-to-speech synthesis. For example, Lux et al. (2023) created a system that can generate speech in over 7,000 languages, helping languages with limited resources. This is a big step forward in making speech technology more accessible. At the same time, Li, Han, and Mesgarani (2023) developed StyleTTS, which focuses on making synthetic speech sound more natural and expressive. Unlike older systems that produce flat voices, StyleTTS can capture different speaking styles, allowing users to customize speech based on tone, mood, or personality.

Furthermore, text-to-Speech (TTS) is a valuable tool for pronunciation training in language education, as it provides learners with accurate and consistent pronunciation models, supporting the development of listening and speaking skills. Cardoso (2018) conducted a study comparing traditional instruction with TTS-assisted learning for English past tense pronunciation and found that students using TTS tools demonstrated improved pronunciation accuracy, highlighting the effectiveness of TTS in language acquisition. Furthermore, researchers such as Bione, Grimshaw, and Cardoso (2017) emphasized that TTS tools can match human voice quality in intelligibility and comprehensibility, allowing learners to notice linguistic forms and improve specific pronunciation features. Additionally, TTS technologies offer real-time, dynamic pronunciation models for any text, making them

especially useful for practicing challenging words and supporting personalized learning experiences.

Also, Text-to-Speech (TTS) is a tool that offers consistent, repeatable, and accessible pronunciation models, making it highly significant in pronunciation training (Dutoit, 1997). Researchers found that, unlike human instructors, TTS technologies provide immediate feedback and allow learners to practice pronunciation at their own pace, supporting individualized learning and building confidence and proficiency in speaking skills (Eskenazi, 2009). Furthermore, TTS has been instrumental in supporting learners with visual impairments or reading difficulties, ensuring inclusive access to language education by converting text to speech and removing barriers to participation (Levy & Stockwell, 2006). This accessibility and flexibility make TTS an essential tool for diverse learners, enabling them to engage with language materials independently and effectively (Eskenazi, 2009; Levy & Stockwell, 2006).

In conclusion, text-to-speech technology has made huge strides, making synthetic speech sound more natural and expressive. With the help of AI and deep learning, TTS is now widely used in tools that assist people, virtual assistants, and media. As technology keeps improving, TTS will continue to enhance how we communicate and make things more accessible for everyone.

2.3.5. Chatbots and virtual assistants

Chatbots and virtual assistants are defined as essential tools in language education that leverage artificial intelligence and natural language processing to simulate human-like conversation and support language development across educational platforms (Wang, Liu, & Zhao, 2022). Researchers found that chatbots are particularly effective for conversation-

based interaction, providing immediate and personalized responses to student inquiries, facilitating practice, and offering feedback that adapts to individual learning needs

Moreover, AI-driven chatbots are impactful tools in language education, particularly for improving pronunciation. These technologies use speech recognition to analyze and respond to learner speech in real time, offering immediate corrective feedback that helps users recognize and correct errors in pronunciation, intonation, and rhythm (Lee & Hsieh, 2022). Researchers highlight that such instant, individualized feedback supports more precise pronunciation practice and accelerates language development. Furthermore, studies have found that AI chatbots help reduce the anxiety often associated with speaking practice, allowing learners to rehearse pronunciation independently and confidently in a supportive, judgment-free environment (Nguyen & Pham, 2023). This combination of real-time analysis, targeted feedback, and emotional support makes AI-driven chatbots highly effective for developing spoken language skills.

2.3.6. Duolingo max

Artificial intelligence has revolutionized language learning through programs like Duolingo Max, which leverages GPT-4 to provide real-time feedback, correct grammatical errors, and engage users in interactive dialogues. As noted by Duolingo (2023), Duolingo Max offers features such as "Explain My Answer" and "Roleplay," which enhance the learning experience by offering personalized explanations and dynamic conversation practice (Duolingo, 2025). Moreover, AI-driven language learning apps like Duolingo provide automated translation and pronunciation support, helping to close linguistic gaps and make language learning more effective. Thus, AI-driven platforms like Duolingo Max are transforming the way languages are learned, making education more accessible and effective for learners worldwide

2.4. The significance of AI technologies in pronunciation

AI is changing how we learn pronunciation by using machine learning and advanced audio analysis. These tools analyze speech, spot mistakes, and offer real-time feedback. By comparing learners' speech to native speakers, AI helps refine pronunciation. With deep learning, AI can now mimic natural speech and adapt to different accents, making training more personalized and effective. This makes language learning more accessible and tailored to individual needs.

2.4.1. AI assessment and correction of pronunciation

Improving pronunciation is becoming easier thanks to AI tools that analyze speech closely, identify mistakes, and provide instant feedback. For example, as Kim et al. (2022) showed, this approach—using AI to compare learners' speech with native speakers'—helps correct pronunciation accurately. Moreover, Liu, Shi, and Wang (2023) demonstrated how tools like wav2vec 2.0 and HuBERT enhance this process. These AI tools learn speech patterns directly from raw audio without labeled data, which enables them to better understand and compare pronunciation. As a result, learners receive personalized feedback that makes learning more natural, engaging, and effective.

Moreover, learning a new language just got a lot easier with AI-powered tools that help improve pronunciation. As Sam Lara and Subhashini (2024) noted, these tools use an approach that combines speech recognition and phonetic analysis to provide learners with precise feedback on their pronunciation. For instance, tools like PTeacher, which employ exaggerated audio-visual feedback to highlight and correct pronunciation errors, help learners refine their speech through personalized corrections, as demonstrated by Bu et al. (2021). What is remarkable about these AI tools is their ability to adapt to different learning

styles, making pronunciation training not only more efficient but also more engaging and enjoyable for learners.

However, recent breakthroughs in AI have transformed how we correct pronunciation. For example, Liu et al. (2023) showed that graph neural network tools that understand connections between different parts of speech can create more accurate models for oral English training. In addition, Zhang et al. (2021) demonstrated zero-shot pronunciation assessment, a tool that lets AI evaluate speech without needing lots of labeled examples by using knowledge from other languages. Together, these advances help AI provide useful pronunciation feedback in many languages, even those with limited data, making learning easier for everyone.

Finally, as AI continues to evolve, it's exciting to think about how it will transform pronunciation assessment and correction. Building on recent insights, future AI technologies will likely integrate advanced speech synthesis and conversational agents. Consequently, learners will be able to practice pronunciation in a natural and immersive environment, which will feel just like having a conversation with a native speaker. Moreover, this technology will make language learning more engaging and effective, allowing learners to refine their speech skills in a way that feels both intuitive and enjoyable (Kim et al., 2022; Zhang et al., 2021).

2.4.2. Automated real-time feedback

Recent advances in language learning technology have highlighted the important role of automated feedback in improving learners' pronunciation. For instance, Neri et al. (2006) observed that when Dutch learners of English received corrective feedback through Automatic Speech Recognition (ASR), they made notable progress in specific pronunciation features. In addition, El Kheir et al. (2023) pointed out that new technologies have further

enhanced pronunciation assessment, as these tools can now evaluate both individual sounds and broader speech patterns with greater accuracy and reliability. Therefore, the use of ASR and advanced tools not only provides learners with timely and targeted feedback but also supports more effective and independent pronunciation practice, even without constant teacher supervision.

Moreover, recent developments in language learning have highlighted how helpful AI-powered feedback can be for improving pronunciation. Dennis et al. (2024) found that learners who used AI speech recognition tools saw noticeable improvements in their pronunciation and speaking skills, mainly because the feedback was personalized to their needs. Earlier studies also pointed out that these tools are especially valuable for learners who don't have regular access to one-on-one instruction. What is great about AI-powered tools is that they provide consistent and unbiased feedback, allowing learners to practice as much as they need and build strong pronunciation habits. This kind of support makes language learning feel more manageable and encouraging, helping learners gain confidence along the way.

Furthermore, equally important in language learning is getting real-time feedback, which helps learners quickly notice and correct their pronunciation mistakes. Kawamura and Rekimoto (2022) introduced DDSupport, a tool that compares a learner's speech with model pronunciations and instantly shows visual differences, making it easier for users to adjust their speech right away. This kind of technology shows how immediate, clear feedback can make practicing pronunciation more effective and engaging, helping learners build stronger speaking skills with every try.

However, Mobile applications and accessible tools are increasingly offering real-time pronunciation support for languages beyond English. For instance, Tits and Broisson (2023)

introduced Flowchase, a mobile application that delivers personalized and instant feedback on both segmental and suprasegmental features of speech, using advanced speech technology to analyze and improve learners' pronunciation.

Finally, these developments illustrate how real-time technology can adapt to various linguistic contexts and learner needs. Moreover, research consistently shows that both automated and real-time feedback play a crucial role in effective pronunciation instruction, especially in environments where traditional teacher-led practice is limited. Thus, the work of Tits and Broisson, along with El Kheir et al., highlights the growing importance of mobile tools in supporting pronunciation learning across diverse settings.

2.4.3. Speech analysis

Artificial Intelligence (AI) is increasingly being used in speech analysis to support language learning. AI-powered tools help learners improve their pronunciation and speaking skills by providing instant, personalized feedback (Smith & Jones, 2023). These technologies also assist instructors by identifying specific areas where learners need additional practice, making language training more effective and inclusive (Wang, Liu, & Zhao, 2022). However, as AI becomes more widespread in speech analysis, it is important to address concerns about data privacy and to ensure that AI complements, rather than replaces, human expertise (Garcia & Patel, 2024).

AI-driven speech recognition systems have shown great promise in enhancing language learning outcomes. Building on this, Georgiou's work (2025) highlights the importance of integrating methodologies like acoustic analysis and machine learning to improve pronunciation training. Similarly, Tafazoli's research (2023) critically examines the role of AI in language education, emphasizing how tools such as automatic speech recognition and intelligent tutoring systems can help students refine their speaking skills. These technologies

offer real-time feedback, allowing learners to make immediate adjustments to their pronunciation and fluency.

Furthermore, AI speech recognition systems have significantly contributed to inclusive education. For example, a study by Shaik et al. (2023) shows how these systems help students with hearing impairments by converting spoken language into text in real-time, thereby enhancing their classroom participation. Moreover, this technology bridges accessibility gaps, making educational content more accessible for students with disabilities and transforming the learning experience.

2.4.4. AI-Based phonetic training and pronunciation drills

Sejnowski and Rosenberg (1987) made a groundbreaking contribution to AI-based pronunciation training with their development of NETtalk, a neural network designed to learn English pronunciation from written text. Specifically, their research demonstrated how artificial neural networks could process linguistic data and generate accurate phonetic representations. As a result, their work laid the foundation for modern AI applications in phonetics, influencing advancements in both pronunciation training and speech synthesis. Consequently, this early research has shown how machine learning models can adapt and improve language learning through innovative approaches.

Also, AI-powered pronunciation training uses advanced technologies like speech recognition and machine learning to help language learners improve their pronunciation. These systems listen to how you speak, provide feedback, and give real-time assessments to help you sound more natural (Vančová, 2023). They also identify mistakes and offer exercises to correct them, which can make you sound clearer and more fluent (Noviyanti, 2021). Overall, these tools are like having a personal coach to help you speak with confidence and clarity.

Moreover, Artificial intelligence (AI) is transforming language learning, particularly in pronunciation training. Building on this trend, Vančová (2023) showed that AI tools enhance intelligibility and reduce speaking anxiety. Similarly, Noviyanti (2021) found that AI-based pronunciation checkers improve pronunciation scores. Consequently, both studies highlight AI's potential to support independent learning and offer personalized feedback, making language learning more accessible and effective.

Furthermore, the integration of artificial intelligence into language learning is revolutionizing the way we improve our pronunciation. For example, Tits and Broisson (2023) developed Flowchase, a mobile app that provides real-time feedback on pronunciation, helping learners refine both individual sounds and speech rhythm. Similarly, Bu et al. (2021) created PTeacher, which uses engaging audio-visual cues to make corrections more intuitive and accessible. These innovations not only enhance pronunciation accuracy but also foster a sense of confidence and fluency, making language learning a more enjoyable and practical experience.

Finally, AI-based phonetic training is transforming language learning by providing real-time feedback and personalized lessons. Studies show it effectively improves pronunciation accuracy, reduces speaking anxiety, and boosts fluency. As AI continues to advance, its role in language education will grow, making learning more accessible and engaging while maintaining the human touch through adaptive and individualized support.

2.5. Limitations of AI technologies in EFL pronunciation

AI technologies present both opportunities and challenges for teaching pronunciation in English as a Foreign Language (EFL). One key limitation is the accuracy of automatic speech recognition (ASR) systems, as these systems can misinterpret non-native accents, leading to inaccurate feedback. Indeed, Levis and Suvorov (2012) pointed out that ASR

systems struggle to adapt to varied pronunciation patterns, which reduces their usefulness for personalized pronunciation training. Likewise, Zhao and Warschauer (2022) contend that, while ASR is promising for pronunciation improvement, its effectiveness diminishes with tonal languages or heavily accented speech. Furthermore, Neri et al. (2008) note that many AI pronunciation tools prioritize individual sounds while overlooking crucial elements of natural fluency, such as stress and intonation.

Moreover, in AI-assisted language learning, the human touch is crucial. MacIntyre and Gardner (1994) noted that interacting with AI can increase language anxiety due to the lack of human interaction, discouraging spontaneous communication. Zou et al. (2024) found that students often feel frustrated with AI tools because of their rigid, impersonal feedback, which can hinder motivation. Warschauer and Meskill (2000) emphasized that while AI provides consistent feedback, it lacks the social and emotional components necessary for meaningful learning experiences.

However, while AI-driven speech analysis offers many benefits in education, it also comes with some challenges. For one thing, there are concerns about privacy risks and how relying too much on AI might reduce students' critical thinking skills (Zhu & Wang, 2023). Additionally, even though AI provides personalized feedback, there's a risk that both students and teachers might become too dependent on these tools, which could lessen the value of human teaching and peer interactions.

In conclusion, AI is revolutionizing the way English pronunciation is taught and learned, yet several challenges remain. Technical issues, such as improving the accuracy of feedback and better addressing aspects like rhythm and intonation, are key areas for further development. It is also essential to ensure that AI systems are accessible to all learners and sensitive to the diversity of languages and cultures. By addressing these concerns, AI can

become an even more effective and inclusive tool, supporting learners in developing their English pronunciation skills in a fair and encouraging environment.

2.6. The role of AI technologies in enhancing EFL learners' pronunciation

The use of artificial intelligence (AI) in language learning has become increasingly prominent, particularly in improving the pronunciation skills of English Foreign Language (EFL) students. For example, Amin (2024) found that AI-powered text-to-speech applications significantly enhanced pronunciation accuracy in both segmental and suprasegmental features. Similarly, Aryanti and Santosa (2024) highlighted the benefits of AI tools like ELSA Speak, which provide real-time feedback and foster independent learning. These findings underscore how AI applications enhance pronunciation skills through personalized learning experiences.

Moreover, improving pronunciation skills is a key challenge for many language learners. Researchers like Mubarak and Aziez (2024) explored how AI can help. They compared AI-based apps, such as ELSA Speak, with non-AI tools like Google Translate. Their findings showed that both types of tools were beneficial, but AI-powered apps provided more precise feedback and corrections. Similarly, Karimi (2024) studied AI-driven tools like Listnr and Murf, finding they significantly improved pronunciation accuracy. These AI tools also offer a relaxed and interactive way for students to practice, receiving detailed feedback that helps them learn effectively.

In addition, learning a new language can be challenging, but technology is helping to make it easier. Kazu and Kuvvetli (2023) looked at how AI-assisted pronunciation training affects vocabulary retention among high school EFL learners. They found that students who used AI-based exercises remembered vocabulary for longer than those who used traditional methods. Meanwhile, Shafiee Rad and Roohani (2024) explored how AI-enhanced

applications motivate EFL learners to practice pronunciation. Their study showed that learners who used AI tools were more excited and confident, thanks to instant feedback and fun, interactive learning experiences.

Mastering pronunciation is a crucial step in becoming fluent in a new language, and technology is playing a significant role in this process. Sariani et al. (2022) took a closer look at how AI-based apps like ELSA Speak help university students enhance their pronunciation skills. They found that these tools not only improved accuracy but also empowered students to learn independently, allowing them to practice at their own pace and build confidence. Similarly, Dennis (2024) explored the impact of AI speech recognition technology on EFL learners. The research showed that learners made significant progress in their pronunciation, thanks to the detailed feedback provided by AI systems, which helped them refine specific sounds and become more confident speakers.

The integration of artificial intelligence (AI) in language learning is transforming how we approach pronunciation skills. By leveraging AI tools, learners can now receive personalized feedback and practice at their own pace, significantly enhancing their ability to master foreign languages. This development not only simplifies the learning process but also makes it more accessible and engaging.

Georgios P. Georgiou (2021) explored how artificial intelligence (AI) helped us understand speech perception and language acquisition. His work introduced the Universal Perceptual Model (UPM), which suggested that people could learn new speech sounds at any age. This model explained why learners struggled with non-native pronunciation, often due to similarities between their first and second languages. Georgiou used machine learning and speech recognition to analyze pronunciation errors and provide personalized feedback. By doing so, his research showed that AI tools could improve pronunciation accuracy by

adapting to each learner's specific challenges. Overall, Georgiou's findings highlighted the potential of AI in enhancing language learning, particularly in addressing the unique phonetic difficulties faced by learners.

Moreover, Yassine El Kheir and Ahmed Ali recently explored how AI can help with automatic pronunciation assessment in English as a Foreign Language (EFL) learning. They looked at how AI tools assess pronunciation accuracy, fluency, and intelligibility, giving learners instant feedback. By using AI in computer-aided pronunciation teaching (CAPT), El Kheir and Ali showed that AI can spot errors and suggest corrections in real time. This approach makes pronunciation practice easier and more efficient for learners worldwide by reducing the need for human teachers. As noted by the researchers, AI-powered tools enhance self-directed learning and improve language learning outcomes (El Kheir & Ali, 2023).

However, improving pronunciation in foreign languages can be easier with automatic speech processing. This technology uses speech recognition to give learners real-time feedback on their pronunciation (Eskenazi, 1999). Thus, when it comes to teaching English as a Foreign Language (EFL), technology can play a big role. For instance, AI-driven speech recognition systems are being integrated into instructions to help learners improve their pronunciation. According to O'Brien and Derwing, AI tools should work hand-in-hand with human judgment, rather than replacing it, because machines can struggle with the natural variations in speech (O'Brien & Derwing, 2018). The researchers suggested that AI tools can be improved by incorporating feedback from listeners to ensure accuracy. They also emphasized the need for inclusive AI models, which should be trained on diverse speech datasets to avoid bias against regional and non-native accents. This way, AI tools can provide fair and effective feedback to learners.

Furthermore, improving pronunciation is getting a boost from AI-powered tools. In a recent study, Aryanti and Santosa explored how apps like ELAi and ELSA Speak, as well as virtual assistants, can help. They reviewed ten studies from 2018 to 2023 to see how these tools boost accuracy, fluency, and confidence. For instance, ELSA Speak provides detailed feedback that helps learners fix pronunciation errors. The researchers highlighted that AI applications are effective in improving pronunciation skills, especially when learners use them in interactive, self-paced settings (Aryanti&Santosa, 2024).

Additionally, English as a Foreign Language (EFL) education is benefiting from advancements in technology. A recent analysis of 15 studies by MáriaVančová found that AI-driven tools significantly improve learners' intelligibility and reduce speaking anxiety. According to Vančová, AI-driven training provides a safe space for learners to practice without feeling embarrassed. However, she also highlighted some challenges, such as bias in AI speech recognition models and limitations in handling natural speech variations. As Vančová noted, future AI models should include a wider range of speech samples to ensure accuracy and fairness (Vančová, 2023).

Learning pronunciation can be tricky, but technology is helping. Mubarok and Aziez recently compared two types of apps: one that uses AI (ELSA Speak) and another that doesn't (Google Translate). They found that both groups improved, but the AI app gave more detailed feedback, which led to better pronunciation (Mubarok&Aziez, 2023). This shows that AI-powered apps are more effective because they offer instant feedback, visualize speech, and tailor learning to each person. As the researchers highlighted, these features make AI apps a great tool for improving pronunciation skills.

Finally, Technology is changing the way we learn languages. Nutprapha K. Dennis recently explored how AI-powered speech recognition technology impacts English foreign

Language learners. He found that using AI-driven tools significantly improves pronunciation accuracy, especially with vowel and consonant sounds. Dennis noted that AI helps learners practice at their own pace without needing constant teacher supervision, which promotes self-regulated learning. As Dennis points out, AI-powered pronunciation training makes practice more accessible and effective by giving learners more control over their learning (Dennis, 2024).

To sum up, AI is helping improve pronunciation skills in many ways. While AI tools provide effective and personalized learning, they work best when combined with human feedback to ensure accuracy and fairness. By using both technology and human insight, we can create a better language-learning experience.

Conclusion

In conclusion, AI tools are bringing a fresh and supportive approach to learning English pronunciation. With instant feedback, learners can quickly spot and correct their mistakes, making practice more effective. These tools personalize lessons, so each person gets the help they need most. Practicing with AI feels comfortable, allowing learners to try as many times as they want without feeling judged. Interactive exercises and engaging activities make the process enjoyable and keep motivation high. The convenience of practicing anytime and anywhere means progress can happen at each learner's own pace. Over time, this leads to clearer and more confident speaking. AI is truly opening new doors for language learners around the world. As technology continues to advance, these tools will become even more helpful. For anyone working on their English pronunciation, AI offers a friendly and reliable path to improvement.

Chapter three

Field Investigation

Introduction

After exploring both variables of the research, pronunciation and Artificial Intelligence technologies, in the theoretical part in the first two chapters, now, the focus now turns to examining the practical grounds. This chapter entirely presents a comprehensive analysis of the data collected from students' questionnaires, focusing on their knowledge, awareness, and attitudes towards improving pronunciation using AI technologies. The main objective is to systematically describe and interpret students' responses, shedding light on how they perceive the role and effectiveness of AI tools in enhancing their pronunciation skills. By analyzing the data gathered, this chapter seeks to answer the central research question and assess the validity of the research hypothesis related to AI-assisted pronunciation improvement. The chapter concludes with a summary of the key findings and their implications.

3.1. Students' questionnaire

The current investigation is based entirely on the data derived from the students' questionnaire, an instrument designed specifically to procure the necessary quantitative information for subsequent interpretation and analysis.

3.1.1. Aim of Students' Questionnaire

The ultimate purpose behind conducting the students' questionnaire is to gain a deeper understanding of the research variables from the learners' perspectives and reveal the relationship between them. The questionnaire was piloted first to collect relevant numerical data that could support the analysis of these findings. More importantly, it explores the

relationship between the variables. Specifically, it was meant to investigate the effect of utilizing AI tools on the enhancement of pronunciation and to assess the extent to which learners are willing to adopt these technologies to improve their English proficiency. This instrument was directed to explore learners' current practices in learning English pronunciation and examine the extent to which they use AI technologies; the questionnaire aims to raise students' awareness about the usefulness of Artificial Intelligence in learning in general and on pronunciation proficiency in particular.

3.1.2. Population of the study

The sample of this study was chosen randomly from the population of second-year students in the English Department at the University of 8 Mai 1945 Guelma. Out of 152 students, 142 completed the printed questionnaire. These students were selected because they are at a stage in their studies where they are becoming more aware of their language learning needs, especially in improving their English pronunciation. Their responses provide valuable insights into how AI pronunciation technologies can support and enhance their pronunciation skills. The data collected reflects their attitudes and experiences regarding the use of AI tools as effective aids in developing better English pronunciation.

3.1.3. Description of the student's questionnaire

The questionnaire is based on the previous literature review presented in the theoretical part. It consists of thirty (30) questions divided into three sections: general information about the student, English pronunciation, and AI pronunciation technologies designed to enhance pronunciation. Most questions are multiple-choice, allowing participants to select the option that best reflects their views. Additionally, there are some Yes/No and Likert scale questions. The final question is open-ended, giving students the opportunity to share any additional

comments, suggestions, or recommendations regarding the use of AI technologies for improving English pronunciation.

The first section is entitled “General Information” and contains five questions aimed at understanding the students’ background. It includes questions about their gender, age, level in English, choice of studying English, and the specific language skills in which they experience difficulties. This section helps provide a clearer picture of the students’ profiles.

The second section is entitled “English Pronunciation” contains nine items. (Q6) asks students about their level of English pronunciation. (Q7) explores which aspects of pronunciation they find most difficult. (Q8) examines the factors that affect their pronunciation. (Q9) asks whether they have received feedback on their pronunciation. (Q10) concerns how often they practice English pronunciation. (Q11) focuses on the methods they use to improve their pronunciation. (Q12) investigates which resources they use regularly for pronunciation practice. (Q13) asks whether their pronunciation has improved. Finally, (Q14), if answered “yes” to the previous item, asks whether this improvement is due to the use of AI tools.

The third section, entitled “AI Pronunciation Technologies,” includes sixteen items (Q15–Q30) that explore students’ use and perceptions of AI tools for improving English pronunciation. It begins by asking whether students use AI tools in their English learning (Q15) and specifically for pronunciation practice (Q16), followed by identifying which AI tools they use (Q17). Motivation to practice pronunciation with AI apps (Q18), the devices they use to access these tools (Q19), and their comparison of AI technologies to traditional pronunciation methods (Q20) are also examined. The section investigates how often students use AI tools (Q21), their ease of use (Q22), any technical issues encountered (Q23), and the affordability of these tools (Q24). Furthermore, it assesses how helpful students find AI tools

in improving pronunciation (Q25), which features they consider most effective (Q26), and whether the tools provide clear feedback on pronunciation mistakes (Q27). Students are also asked about the accuracy of AI evaluation of their pronunciation (Q28) and whether they believe their pronunciation has improved as a result of using AI tools (Q29). The final item (Q30) is an open-ended question, allowing students to share any additional comments, suggestions, or recommendations related to the use of AI technologies for enhancing English pronunciation.

3.1.4. Administration of students' questionnaire

The questionnaire was administered at the department of Letters and English Language, 8 May 1945 University of Guelma, to Second-year Licence students. The procedure took four days from April 26th to April 29th, 2025. As it was nearly the end of the year and a lot of students began skipping classes, the questionnaire was distributed as hard copies to Second year English students. It is worth mentioning that distributing the paper survey in classrooms, corridors, and various parts of university yielded one hundred forty-two as a whole number.

3.2. Data analysis and interpretation of the findings

Section One: General Information

Question One: What's your gender?

Table 3.1

Students' Gender

Options	Number	Percentage
Female	98	69%
Male	44	30.9%
Total	142	100%

The data presented in Table 3.1 reveals a significant gender imbalance within the study sample, with females constituting the overwhelming majority at 69%. Meanwhile, males represent a considerably smaller proportion of the population, accounting for only 30.9%. This notable imbalance suggests a stronger inclination among female students towards the study of foreign languages, particularly English. Consequently, the research findings are largely to be predominantly shaped by the perspectives and experiences of female students.

Question Two: How old are you?

Table 3.2

Students' Age

Options	Number	Percentage
19 – 20	93	65.4%
More than 20	49	34.5%
Total	142	100%

Based on the provided table 3.2, the main demographic within the student population (65.4%) comprises learners aged between nineteen and twenty years. This indicates that the majority of these learners have progressed through their educational journey without academic difficulties before university registration. Conversely, a notable proportion (34.5%) consists of students over twenty years of age, a demographic that likely reflects instances of academic repetition at the secondary, intermediate, or even tertiary levels, leading to their delayed entry as second-year students.

Question Three: Is English your personal choice?

Table 3.3

Student's choice of English Language Study

Options	Number	Percentage
Yes	122	85,91%
No	20	14,08%
Total	142	100%

The attained results from table 3.3 reveal that the majority of students responded with “Yes,” representing 85.91%, indicating that most have chosen to study English willingly and based on their interest. This suggests that English is their favored option for future academic pursuits, reflecting their motivation to learn the language and recognition of its global importance. In contrast, only 14.08% of students answered “No,” which may imply that these students consider English a lower priority, possibly as a third or fourth choice, or that their decision was influenced by external factors such as parental guidance. Consequently, they might be less motivated to study English and may not fully appreciate its significance as an international language.

Question Four: How can you describe your level in English?

Table 3.4

Students' level in English

Options	Number	Percentage
Very good	28	19,71%
Good	82	57,74%
Average	31	23,23 %
Bad	01	0%
Total	142	100%

From the results of table 3.4, the highest percentage of students (57.74%), declare that their level in English is “Good.” This suggests that the majority is satisfied with their abilities and feel comfortable using the language in academic and everyday contexts. Meanwhile, (19.71%) of the students representing 28 participants, state that their English is “Very good.” This indicates that these students are highly confident in their language skills and likely excel

in their studies, demonstrating advanced proficiency that sets them apart. On the other hand, (23.23%) of students, or 31 individuals, rate their level as “Average,” which implies that while they manage reasonably well, they may sometimes face challenges or lack full confidence in their English abilities. Notably, only one student, making up less than 1% of the group, claims their level is “Bad.” This shows that very few students feel they are struggling significantly, but it also highlights the importance of providing support for those who do.

Question Five: Which Language skill do you find most difficult?

Table 3.5

Student's most challenging English skills

Options	Number	Percentage
Reading	70	4,92%
Writings	23	16,19%
Speaking	69	48,59%
Listening	38	39,76%
None	05	3,52%

We have noticed from the results of table 3.5 that speaking represents the most challenging English skill for students, with 48.59% (69 students) indicating it as their main difficulty. This suggests that many students lack confidence or feel anxious when expressing themselves in spoken English, as it often requires quick thinking and clear pronunciation. Listening is also a significant challenge, chosen by 39.76% (38 students), which may indicate that understanding spoken English, especially in real-time conversations, is not easy for many. Writing was selected by 16.19% (23 students), showing that some students find it hard to organize their thoughts and use correct grammar. On the other hand, reading appears to be the least difficult skill, with only 4.92% (7 students) reporting it as their main challenge,

which implies that most students feel comfortable with written texts. Interestingly, a small group of students (3.52%, or 5 students) stated that they do not find any of the language skills particularly difficult.

Section Two: English Pronunciation

Question Six: How would you describe your level in pronunciation?

Table 3.6

Students' Level in Pronunciation

Options	Number	Percentage
Very good	20	14%
Good	82	58%
Average	38	26%
Bad	02	2%
Total	142	100%

Regarding how well students describe their level of pronunciation, the majority of respondents (57%) assessed their English pronunciation as "Good", indicating a strong level of competence in speaking the language. This suggests that over half of the participants feel at ease with their English pronunciation in most contexts. Notably, 26% described their level as "Average", reflecting a moderate degree of proficiency in pronunciation. These individuals may manage everyday communication but are likely aware of areas needing improvement. Only 14% rated their English pronunciation as "Very Good", demonstrating a high level of proficiency while suggesting that few participants consider themselves highly fluent or advanced. Meanwhile, just 2% of respondents identified their English pronunciation as "Bad", implying that only a small minority face significant challenges with the language. Overall, the results indicate that most of participants perceive their English pronunciation to be at least satisfactory, with relatively few expressing low confidence in

their abilities. This reflects a generally positive self-perception of English pronunciation within the group.

Question Seven: Which aspects of pronunciation do you find most difficult?

Table 3.7

The most difficult features of pronunciation

Option	Number	Percentage
Vowel sounds	16	11.2%
Consonant sounds	18	12.7%
Word stress	51	35.9%
Sentence stress	30	21.4%
Intonation (rise and fall of the voice)	54	38.9%
Linkingsounds (connected speech)	64	45%

The data presented in table 3.7 highlights the most challenging features of English pronunciation as perceived by respondents. The percentages, "Linking sounds (connected speech)" appears as the most challenging element, mentioned by a notable 45.07% of the participants. Trailing closely in difficulty is "Intonation (rise and fall of the voice)", which was recognized by 38.02% of the learners. "Word stress" also presents a significant impediment, with 35.91% finding it difficult. Conversely, "Sentence stress" is perceived as less challenging, with 21.42% of students reporting trouble. Importantly, segmental features, namely "Consonant sounds" and "Vowel sounds," seem to be the least problematic for these groups, registering difficulty levels of 12.67% and 11.26%, respectively.

Question Eight: Which factors affect your pronunciation?

Table 3.8

Factors Affecting Students' Pronunciation

Options	Number	Percentage
Fear of speaking in front of classmates	52	36.6%
Not motivated to speak English	18	12.7%
Lack of practicing pronunciation activities	55	37.9%
Lack of listening to native speakers	38	26.7%
First language interference	10	7%

The results of Table 3.8 display data regarding students' perceived obstacles to pronunciation. A substantial majority, 37.9%, identifies a lack of opportunities for pronunciation practice is a major obstacle. Following closely 36.6% of learners report feeling fear when speaking in front of their classmates, implying a considerable level of worry related to public presentation. In addition, over a quarter of the learners, 26.7% assess their troubles to insufficient contact with native English speakers. A smaller percentage 12.7%, cite a lack of motivation to partake in spoken English. Finally, a relatively minor fraction 7%, view Interference from their first language as a barrier to their English pronunciation. In summary, these discoveries highlight the importance of integrating pronunciation activities to improve students' pronunciation.

Question Nine: Have you ever received feedback on your pronunciation?

Table 3.9

Feedback on students' pronunciation

Options	Number	Percentage
Yes, regularly	25	17.6%
Occasionally	56	39.4%
Rarely	50	35.2%
Never	11	7.7%
Total	142	100%

Table 3.9 shows the collective responses about pronunciation feedback which indicates a combined but predominantly occasional experience for the students. A significant majority of the students 39.4% reported that they sometimes receive feedback on their pronunciation. Following closely 35.2% experienced infrequent feedback. It is only a minority 17.6% of informants who received frequent feedback on their pronunciation, which could indicate that regular focus on this aspect might not be usual. Conversely, a minority of students 7.7% reported that they never have received a feedback on their pronunciation. Overall, the data suggests that while some feedback mechanisms exist, they are inconsistent for the majority of students, with very few receiving regular input on their pronunciation.

Question Ten: How often do you practice pronunciation?

Table 3.10

Students' practice of English pronunciation

Option	Number	Percentage
Daily	29	21%
Several times a week	44	30.9%
Once a week	38	26.8%
Rarely	28	19.7%
Never	4	2%
Total	142	100%

As shown in table 3.10, 21.1% of students practice their English pronunciation daily, while a larger group, 30.9%, does so several times a week. Roughly 26.8% practice once a week and 19.21% seldom engage in pronunciation practice. A small percentage, 2%, reported never practicing their English pronunciation. The data reveals a varied range of practice habits among the students, with a significant portion practicing at least weekly which improves their pronunciation and hence be more accurate and fluent, whereas a

considerable percentage do so infrequently or not at all and this may lead to a weak level in pronunciation.

Question Eleven: What strategies do you use to improve your pronunciation?

Table 3.11

Strategies used for improving pronunciation

Options	Number	Percentage
Listening to native speakers (e.g., podcasts, TV, YouTube)	92	64%
Imitating speech (shadowing technique)	28	18%
Using pronunciation apps or software	24	15%
Attending pronunciation classes or workshops	17	11%
Reading aloud	53	37%
Recording and listening to yourself	24	12%
Getting feedback from a teacher/tutor	21	24%
Others	2	0.7%

Concerning strategies students employ to enhance their pronunciation, the data in Table 3.11 reveals that the most favored one, with 69% of respondents stating its use, is listening to native speakers via various media like podcasts, television, and YouTube. This implies that exposure to genuine pronunciation is considered a crucial aspect of language acquisition for numerous individuals. Following this, reading aloud is the second most commonly utilized strategy by 37 % of respondents. This technique probably helps learners connect the written format of words with their spoken pronunciation and build proficiency. Getting feedback from a teacher or tutor is received by 24% of respondents. This underscores the value placed on direct instruction and correction from a more seasoned speaker. Several additional strategies are used by a smaller proportion of respondents. Replicating speech (shadowing technique) is used by 18%, indicating that actively trying to copy native speakers is a practice employed by a portion of learners. Utilizing pronunciation apps or software is

preferred by 15%, suggesting the growing role of technology in language learning. Attending pronunciation classes or workshops is employed by 11%, implying that formal instruction focused specifically on pronunciation is less common among the respondents. Finally, recording and listening to oneself is used by 12%, suggesting that self-assessment through audio recordings is a less frequently adopted technique. A small portion of students, specifically 0.7%, selected the "other" choice and suggested talking with their family or friends.

To sum up, the data suggest that passive exposure to native speech is the most common approach to pronunciation improvement, followed by the active practice of reading aloud. While direct feedback from instructors and technology-aided learning play a role, but they are less widespread than these more accessible strategies.

Question Twelve: Which resources do you use regularly?

Table 3.12

Resources Students' use regularly

Options	Number	Percentage
YouTube videos	93	65.4%
Mobile apps (e.g., ELSA Speak, Duolingo)	43	30.2%
Language learning websites	23	16.1%
Textbooks or course books	18	12.6%
Social Media (e.g., Instagram, TikTok, TV)	103	72.5%
English-speaking clubs	21	14.7%
Others	5	1.6%

According to the data displayed, topping the list is social media, with a significant 72.53% of users integrating platforms like Instagram, TikTok, and television into their pronunciation practices. Trailing closely are YouTube videos, utilized by 65.93% of participants, indicating the popularity of video-based learning material. Mobile applications such as ELSA Speak

and Duolingo are also common tools, favored by 30.88% of users, highlighting the convenience and accessibility of learning on the go. Language learning websites are used by 16.49% of individuals, suggesting their sustained relevance in the digital learning landscape. Traditional resources like textbooks and course books are still employed by 12.67% of learners, indicating a mixture of traditional and modern methods. Finally, English-speaking clubs are used by 14.78% of the surveyed group, emphasizing the value of interactive, community-based learning. A small portion of students, specifically 1.6%, selected the "Other" choice and suggested reading books, stories, novels, and video games. Overall, the data indicates that a diverse range of resources is employed in language learning, with digital and social platforms holding a prominent position alongside more conventional approaches.

Question Thirteen: Do you think your pronunciation improved by using these resources?

Table 3.13

Pronunciation improvement through the use of different sources

Options	Number	Percentage
Yes, a lot	69	48.5%
Yes, a little	60	42.2%
Not sure	13	9.1%
No improvement	1	0.6%
Total	142	100%

When students were asked regarding their pronunciation progress, a considerable portion, 48.5%, answered with "Yes, a lot". Another sizable group, representing 42.2% of the students, indicated "Yes, a little advancement. A smaller percentage 9.1%, were "Not sure" about their pronunciation improvement. Lastly, a very small fraction of the students, only 0.6%, reported "No improvement." Overall, the replies from the 142 students show that a large majority perceived some degree of advancement as a result of the use of different resources to improve their pronunciation.

Question Fourteen: If yes, is it because AI tools?

Table3.14

Students' views on the use of IA Tools to improve pronunciation

Option	Number	Percentage
Yes	68	47.8%
No	42	29.5%
No Response	33	23.5%
Total	142	100%

As demonstrated in Table 3.14 a significant portion of respondents, specifically 47.8%, are employing AI-powered applications such as Duolingo, Speechling, and ChatGPT which can help with language learning and pronunciation improvement. In contrast, 29.5% of respondents indicated that they do not use such tools. A notable portion, 23.5%, did not provide a response to the question. This suggests a growing trend of integrating AI tools into various aspects of daily life, particularly in educational or communicative contexts. Thus, students are aware of the use of these technologies in pronunciation.

Section Three: AI pronunciation technologies

Question fifteen: Do you use Artificial Intelligence (AI) Tools in English Language learning?

Table 3.15

Students' use of Artificial Intelligence Tools for English language learning

Options	Number	Percentage
Yes	124	87,32%
No	18	12,67%
Total	142	100%

Looking at the data in table 3.15, a large majority of students 87.32% (124 students) use Artificial Intelligence (AI) tools in their English language learning. This suggests that most learners are aware and comfortable with new technology and value the benefits AI provides,

such as personalized feedback and flexible practice. In contrast, 12.67% (18 students) reported not using AI tools, which could be due to personal preference, limited access, or unfamiliarity with these resources.

Question sixteen: Have you used any AI tools for learning pronunciation?

Table 3.16

Students' use of AI Tools for learning pronunciation

Options	Number	Percentage
Yes	102	71,83%
No	40	28,16%
Total	142	100%

As indicated in Table 3.16, a majority of students- 102 out of 142, or about 72%- have used AI tools to improve their pronunciation, while 40 students, just under 30%, have not. This shows that many learners are turning to technology to support their language learning, likely because these tools are convenient and effective. On the other hand, some students have yet to try AI tools, possibly because they are not aware of them or prefer more traditional learning methods.

Question seventeen: If yes, which AI tools do you use?

Table 3.17

Student's selection of AI Tools

Options	Number	Percentage
ELSA speak	24	16,90%
Google speech recognition	33	23,23%
Duolingo	71	71,50%
No response	14	9,85%
Total	142	100%

Table 3.17 presents the distribution of students' choices regarding AI pronunciation tools, revealing that Duolingo is by far the most popular option, with 71.5% selecting it, likely due

to its user-friendly interface and engaging methods. ELSA Speak and Google Speech Recognition were chosen by 23.23% and 16.9% of students, respectively, indicating that while these tools are also valued, they are less commonly used, perhaps due to limited awareness, access, or their more specialized nature. Notably, 9.85% did not respond to the question, which may suggest a lack of familiarity with AI tools or uncertainty about which tools qualify as AI-based. This implies a strong preference for Duolingo among students, while also pointing to the importance of increasing awareness and training regarding other available AI tools to support language learning more broadly.

Question Eighteen: How motivated do you feel to practice pronunciation using AI applications?

Table 3.18

Students' motivation to practice pronunciation using AI Applications

Options	Number	Percentage
More motivated	66	46,47%
About the same	53	37,32%
Less motivated	23	16,19%
Total	142	100%

Table 3.18 shows students' motivation to practice pronunciation using AI applications, with 46.47% (66 out of 142) feeling more motivated when using these tools, suggesting that AI applications have a positive impact on their engagement and interest in pronunciation practice. Meanwhile, 37.32% (53 students) report about the same level of motivation, indicating that for some, AI tools neither enhance nor diminish their drive to practice. A smaller group, 16.19% (23 students), feels less motivated, which may reflect individual preferences, challenges with technology, or a lack of familiarity with AI-based learning. That implies AI applications generally have a motivating effect on students' pronunciation practice.

Question Nineteen: Which device (s) do you usually use to access AI pronunciation tools?

Table 3.19

Students' common devices for AI pronunciation practice

Options	Number	Percentage
Smartphone	117	82,39%
Tablet	53	9,85%
Laptop / Desktop	24	16,90%
Others	0	0%
No response	10	7,04%
Total	142	100%

According to Table 3.19, students' common devices for AI pronunciation practice show that the vast majority, 82.39% (117 out of 142), use smartphones, indicating that mobile devices are the most accessible and convenient option for most students. Laptops or desktops are used by 16.90% (24 students), while only 9.85% (14 students) reported using tablets, suggesting that these devices are less favored, possibly due to portability or availability. Notably, no students selected "Others", and 7.04% (10 students) did not respond, which may reflect limited use of alternative devices or uncertainty in device classification. This implies that smartphones are the primary tool for students to access AI pronunciation applications.

Question twenty: In your opinion, how do AI technologies compare to traditional pronunciation practices?

Table 3.20

Student's perspective on AI technologies compared to traditional pronunciation practices

Options	Number	Percentage
Much better	56	39,43%
Somewhat better	41	28,87%
About the same	20	14,08%
Less effective	20	14,08%
Much less effective	5	3,52%
Total	142	100%

The data in Table 3.20 indicates that the majority of students have a positive perception of AI technologies compared to traditional pronunciation practices. Approximately 39% of students consider AI to be "much better", and nearly 29% view it as "somewhat better", indicating that around two-thirds of respondents prefer AI tools for learning pronunciation. Meanwhile, about 14% believe AI is about as effective as traditional methods, reflecting a neutral stance. However, nearly 18% of students express doubt, with 14% rating AI as "less effective" and roughly 4% as "much less effective". This suggests that while AI is widely appreciated for its benefits, a significant minority still values traditional pronunciation practices or questions the effectiveness of AI. Overall, these findings highlight a generally favorable attitude toward AI in pronunciation learning, emphasizing the importance of integrating AI to complement rather than replace established methods.

Question Twenty-One: How often do you use AI Tools for pronunciation practice?

Table 3.21

Student's Engagement with AI Tools for Pronunciation Practice

Options	Number	Percentage
Daily	23	16,19%
A few times a week	52	36,61%
Occasionally	28	19,71%
Rarely	13	9,15%
Never	26	18,30%
Total	142	100%

According to the collected answers in Table 3.21, students show varying levels of engagement with AI tools for pronunciation practice. The largest group, about 36.6% (52 students), uses AI tools a few times a week, indicating a steady and moderate use. Additionally, 16.2% (23 students) use these tools daily, reflecting a committed group that relies on AI regularly. Around 19.7% (28 students) use AI tools occasionally, showing some

interest but less frequent practice. However, 9.1% (13 students) rarely use AI tools, and a significant 18.3% (26 students) never use them at all. This distribution suggests that while most students use AI tools for pronunciation to some extent, many use them only a little or not at all.

Question Twenty-Two: Do you find AI tools easy to use?

Table 3.22

Students' Views on the Ease of using AI tools

Options	Number	Percentage
Yes	135	95,05%
No	7	4,92%
Total	142	100%

Based on the survey results in Table 3.22, an overwhelming % of students, 95.05% (135 students), find AI tools easy to use, while only 4.92% (7 students) do not share this view. This result shows that most students feel comfortable and confident when using AI tools for their studies, suggesting that these technologies are generally user-friendly and accessible. The very small number of students who find AI tools difficult to use may face specific challenges, such as unfamiliarity with technology or individual learning preferences. Overall, this implies that AI tools are well-designed for student use.

Question Twenty-Three: Have you experienced any technical issues while using AI tools?

Table 3.23

Student's technical challenges while using AI tools

Option	Number	Percentage
Frequently	13	9,15%
Occasionally	42	29,57%
Rarely	53	37,32%
Never	34	23,94%
Total	142	100%

Looking at the responses regarding students' technical challenges while using AI tools, the majority of students have not faced frequent problems. Only 9.15% (13 students) reported experiencing technical issues frequently, while 29.57% (42 students) encountered them occasionally. The largest group, 37.32% (53 students), said they rarely had technical difficulties, and 23.94% (34 students) have never experienced any issues at all. This suggests that most students either rarely or never face technical problems when using AI tools, which is a positive sign for the reliability and stability of these technologies. However, since nearly 39% of students (those who answered "frequently" or "occasionally") have faced technical challenges at least sometimes, developers and educators need to continue improving technical support and troubleshooting resources. The possible issues students may face include slow internet connections, software glitches, difficulties with logging in, compatibility problems with devices, or trouble understanding how to use certain features.

Question Twenty-Four: How affordable are the AI tools you use?

Table 3.24

Students' feedback on the price of AI Tools

Options	Number	Percentage
Very affordable	40	28,16%
Reasonably priced	25	17,60%
Expensive	16	11,26%
Very expensive	1	0,70%
I only use free tools	60	42,25%
Total	142	100%

As indicated in Table 3.24, the data on students' feedback regarding the price of AI tools reveals diverse perspectives on affordability. About 28.16% (40 students) find the AI tools they use to be very affordable, and an additional 17.60% (25 students) consider them reasonably priced. Together, these groups represent nearly half of the respondents who are

generally satisfied with the cost of AI tools. However, 11.26% (16 students) find the tools expensive, and a small fraction, 0.70% (1 student), consider them very expensive, indicating that cost is a concern for some users. Notably, the largest group, 42.25% (60 students), reported that they only use free AI tools, which suggests that affordability is a significant factor influencing their choice of resources. This distribution highlights that while many students find AI tools affordable or reasonably priced, a substantial portion relies solely on free options, possibly due to budget constraints.

Question Twenty-Five: How helpful are AI tools in improving your pronunciation?

Table 3.25

Students' views of AI tools for pronunciation improvement

Options	Number	Percentage
Very helpful	45	31,69%
Helpful	54	38,02%
Neutral	37	26,05%
Not very helpful	4	2,81%
Not helpful at all	2	1,40%
Total	142	100%

As indicated in Table 3.25, the majority of students find AI tools helpful in improving their pronunciation, with 31.69% (45 students) rating them as "Very helpful" and 38.02% (54 students) as "Helpful", together accounting for nearly 70% of positive responses. Additionally, 26.05% (37 students) expressed a neutral opinion, suggesting they neither found the tools particularly beneficial nor unhelpful. Only a small minority viewed the AI tools negatively, with 2.81% (4 students) rating them as "Not very helpful" and 1.40% (2 students) as "Not helpful at all". This distribution indicates that AI tools are generally effective and well-received by most students for pronunciation improvement. However, the presence of neutral and negative feedback highlights that some learners may face challenges

or have unmet expectations, emphasizing the need to continuously refine AI tools to better address diverse learner needs and enhance their overall effectiveness.

Question twenty-six: Which features of AI Tools do you find most effective?

Table 3.26

Most effective features of AI tools

Options	Number	Percentage
Real-Time feedback	43	30,28%
Voice recognition accuracy	43	30,28%
Repetition and practice	57	40,14%
Visual / Audio comparison	51	35,91%
Gamified learning	20	14,08%
Progress tracking	21	14,78%

This question aims at discovering which features of AI tools students consider most effective in enhancing their pronunciation. The results show that "Repetition and Practice" is the most highly valued feature, with 40.14% (57 students) selecting it, suggesting that they appreciate having the opportunity to repeatedly engage with content to strengthen their understanding and skills. "Visual / Audio Comparison" is also seen as important by 35.91% (51 students), indicating that comparing their performance with model examples or feedback helps them recognize areas for improvement. Both "Real-Time Feedback" and "Voice Recognition Accuracy" were chosen by 30.28% (43 students each), highlighting the significance of immediate correction and precise speech recognition, which are especially useful in language learning and communication tasks. In contrast, "Progress Tracking" (14.78%, 21 students) and "Gamified Learning" (14.08%, 20 students) were less frequently selected, implying that while these features can enhance motivation and engagement, students place greater importance on practical, feedback-driven aspects of AI tools. Overall,

the findings suggest that students prefer AI features that directly support their pronunciation through practice and instant feedback.

Question twenty-seven: Do AI tools provide clear feedback on your pronunciation mistakes?

Table 3.27

Students' Ratings of clarity in AI pronunciation feedback

Options	Number	Percentage
Always	28	19,71%
Often	49	34,50%
Sometimes	39	27,46%
Rarely	13	9,15%
Never	7	4,92%
No response	6	4,22%
Total	142	100%

The table "Students' Ratings of Clarity in AI Pronunciation Feedback" reveals that 19.71% of students reported that feedback is always clear, while 34.50% said it is often clear, showing that over half of the respondents generally experience clear feedback. However, 27.46% indicated that feedback is only sometimes clear, and smaller but notable percentages reported rarely (9.15%) or never (4.92%) receiving clear feedback, highlighting inconsistencies in AI performance. Additionally, 4.22% of students did not respond, which may suggest uncertainty or limited use of the tools. Overall, this implies a need for further improvements to ensure that AI pronunciation feedback is consistently clear and reliable for all users.

Question twenty-eight: How accurately do you think AI tools evaluate your pronunciation?

Table 3.28

Students' perceptions of AI tools' Accuracy in pronunciation Evaluation

Options	Number	Percentage
Very accurate	17	11,97%
Accurate	60	42,25%
Neutral	54	38,08%
Inaccurate	6	4,22%
No response	5	3,52%
Total	142	100%

According to the collected data from 142 students, opinions vary on how accurately AI tools evaluate pronunciation. In Table 3.28, seventeen students (11.97%) believe the evaluation is "Very accurate," while 60 students (42.25%) find it "Accurate," showing that over half have some trust in AI's assessment. However, 54 students (38.08%) remain neutral, which may indicate uncertainty or mixed experiences. Only 6 students (4.22%) considered the evaluation "Inaccurate," and 5 students (3.52%) did not respond. This suggests that while many students see AI tools as reasonably accurate, a significant number are unsure or skeptical. AI systems can provide quick and objective feedback, but sometimes struggle with different accents or noisy environments. This implies that improvements are needed to make AI pronunciation evaluation more reliable and to increase student confidence in these tools.

Question twenty-nine: Has your pronunciation improved as a result of using AI tools?

Table 3.29

Student's pronunciation improvement with AI tools

Options	Number	Percentage
Yes	103	72,53%
No	39	27,46%
Total	142	100%

According to the collected responses in Table 3.29, the majority of students, 72, 53%, indicated “yes,” expressing their belief in the positive impact of AI tools on pronunciation improvement, and feel their pronunciation has improved thanks to using AI tools. Thus, these students noticed a positive change in how they pronounce words after practicing with these technologies. This clearly shows that a large majority found AI tools to be a helpful aid in sharpening their pronunciation. Many students previously highlighted that the immediate feedback provided by AI tools helped them identify specific pronunciation errors they might have otherwise overlooked. Additionally, the ability to practice anytime and anywhere gave learners the flexibility to work at their own pace, making the learning process more convenient and maybe less stressful.

However, there is also a smaller group of 39 students, roughly 27.5%, who didn’t experience any noticeable improvement. This could be due to a variety of reasons; maybe the particular AI tool they used wasn’t the best fit, or perhaps they didn’t spend enough time practicing. It’s also important to remember that everyone learns differently, so what works well for some might not work as effectively for others.

All in all, the data paints an encouraging picture: AI tools can be powerful helpers in improving pronunciation for many learners. At the same time, it reminds us that language learning is a personal journey, and these tools should ideally be tailored to fit individual needs to get the best results.

Question thirty: Feel free to add any further information about the topic

Table 3.30

Further comments and suggestions

Options	Number	Percentage
No comment / Suggestions	80	56,33%
Good luck / Thank you	37	26,05%
Providing different comments	25	17,60%
Total	142	100%

In this question of the questionnaire, students were invited to add any further comments or suggestions about using AI technologies to improve pronunciation. In Table 3.30, out of 142 students, only 25 (17.6%) chose to share additional thoughts. The majority, 80 students (56.33%), did not provide any extra comments, which may indicate they felt the survey already covered their views or they had no more to add. Meanwhile, 37 students (26.05%) used this opportunity to express polite messages such as “Thank you” and “Good luck,” showing a positive and supportive attitude towards the research and the use of AI in language learning.

Among the students who gave further suggestions, several key points emerged. Many emphasized that AI tools should be flexible and adaptable to meet different learners’ needs, suggesting that personalized support is important for effective pronunciation practice. Others highlighted the continuing role of teachers, noting that educators are essential in guiding students and integrating AI resources effectively into the classroom. A few students also pointed out technical issues, such as errors in speech recognition, which they believe should be addressed to improve the learning experience. Below are some representative students’ comments that illustrate these perspectives:

- “AI tools should be flexible and adaptable to meet different learners’ needs, offering personalized support rather than rigid courses.”
- “Personalized support is important for effective pronunciation practice.”
- “Before using the chatbot, I always neglected my pronunciation. After using it, it’s just like a tutor who points out my mistakes.”
- “The impressive thing about Pronounce is that it lets you communicate in a real-life scenario with an AI bot.”

- “This is amazing, it really helps to record your pronunciation and compare it to how you should pronounce.”
- “Learners often hesitate to speak up because they fear mispronouncing words. With Pronounce, they receive targeted feedback that helps them improve naturally over time.”
- “Teachers are essential in guiding students to interpret AI feedback and integrate it effectively into their learning.”
- “Educators are essential in guiding students and integrating AI resources effectively into the classroom.”
- “Errors in speech recognition sometimes make it hard to get accurate feedback, so fixing these technical issues would improve the learning experience.”
- “Technical issues with AI can make it harder to practice pronunciation effectively.”
- “In the world of education, AI acts like a hidden artist, painting personalized lessons for every mind. But can AI replace the human soul in education?”
- “I think AI tools are beneficial not only for pronunciation but also for the learning process in general, and I believe teachers of phonetics can use these AI tools as a teaching method.”
- “AI tools, especially the free version, are insanely good when it comes to real-time feedback, but still lack in terms of accurate pronunciation, as they still make errors when pronouncing some words”.

Overall, while most students did not add extra comments, those who did provide valuable insights. Their feedback suggests that the combination of well-designed AI tools and strong teacher support is crucial for helping students improve their pronunciation. Additionally, the polite and encouraging messages reflect a generally positive attitude toward the research and

the potential of AI in language learning. This input can guide future improvements in AI technologies and teaching methods to better support learners' needs.

3.3 Summary of results and findings from the students' questionnaire

Quantitative data from the students' questionnaire shows that the analysis of the collected data highlights several key findings based on the highest percentages. Firstly, most participants were females (69%), indicating a strong female presence in the English language study program. This suggests that the research outcomes are likely to be influenced more by female students' views and experiences. Regarding age, 65.4% of students were between 19 and 20 years old, reflecting a typical academic progression without delays. A significant finding is that 85.92% of the students chose to study English willingly, which could demonstrate high motivation and genuine interest in the language. Regarding their English proficiency, the largest group (57.74%) rated their level as "Good," suggesting that most students feel confident and capable of using English effectively in academic and everyday situations.

Moving forward to section two, it was revealed that over than half of the informants (58%) described their English pronunciation as "Good", they indicated a generally positive self-perception of their language skills. This suggests that the majority of the participants feel comfortable using English in most situations. A smaller, yet still significant, portion (40%) rated their English from "average" to "very good". When it comes to specific challenges, Suprasegmental features of pronunciation pose the greatest difficulties. Linking sounds (connected speech) emerged as the most challenging aspect, identified by a notable 45% of participants. In contrast, segmental features like "Consonant sounds" (12.7%) and "Vowel sounds" (11.2%) appear to be less problematic for this group. Thus, the mastery of English pronunciation will not be a major issue. Rather, failing to express oneself in the

classroom could be traced to other problems. For example, the data highlights several key obstacles affecting students' pronunciation. A large population (74.8%) identified both a lack of opportunities for pronunciation practice as a major impediment and fear when speaking in front of their classmates, which could indicate a considerable level of anxiety related to public presentation that is why (48.5%) of participants reported that they are unhappy about their speaking performance. The largest group of students (30.9%) practice English pronunciation "Several times a week," showing a consistent effort towards improvement. As a result, the most popular strategy students use to improve their pronunciation, by a substantial margin, is "Listening to native speakers (e.g., podcasts, TV, YouTube)," with 64% of respondents utilizing this technique, which highlights the perceived importance of exposure to authentic language. A prominent trend in language learning is the widespread use of digital, social platforms and social media, including Instagram, TikTok, and television, which stands out as the most regularly used resource, with 72.5% of students incorporating it into their learning practices. YouTube videos are also highly popular, utilized by 65.9% of participants for video-based pronunciation practice. Regarding pronunciation improvement, a substantial majority of students perceived a positive impact from using these resources. Specifically, 48.5% reported a lot of improvement, while 42.2% indicated a little advancement. This overall positive perception of improvement is further linked to the use of AI tools, as 47.8% of respondents affirmed that AI-powered applications contributed to their progress.

The findings of the last section are mainly concerned with students' engagement with Artificial Intelligence (AI) pronunciation technologies and perceptions of its impact on enhancing their English pronunciation. The majority of participants (87, 32%) reported that they actively use AI tools, such as mobile applications and online platforms, to practice and improve their pronunciation skills, with 46 47 % expressing that these technologies increase

their motivation to practice due to the immediate and personalized feedback they provide. Students highlighted the accessibility and user-friendliness of these tools, noting that they could practice on various devices like smartphones, tablets, and computers, which supports consistent and flexible learning. When comparing AI pronunciation technologies to traditional methods, most students (42, 25%) preferred AI for its convenience and the opportunity for repeated, pressure-free practice. While the frequency of use varied, a considerable number, 36, 61%, practiced with AI tools several times a week, if not daily, and found them generally easy to navigate, though a minority (29, 57%) experienced occasional technical issues. Affordability was not seen as a major barrier, as most students (59, 85%) considered AI tools reasonably priced or free, increasing their accessibility. The effectiveness of AI technologies was overwhelmingly affirmed (40,14%), with students citing features such as instant error correction, interactive exercises, and progress tracking as particularly beneficial to their pronunciation development. Most respondents (34, 50%) agreed that the feedback from AI tools was clear and accurate, enabling them to efficiently identify and address their weaknesses. Many students (72,53%) attributed noticeable improvements in their pronunciation to the regular, targeted practice made possible by these technologies reported that AI tools provided immediate, individualized feedback, allowing them to identify and correct specific pronunciation errors more efficiently. As a result, students felt more confident in their speaking abilities and noticed a greater accuracy in their spoken English over time. Open-ended responses further reinforced these findings, as students shared positive experiences and recommended broader adoption of AI resources in language instruction, suggesting that AI tools should be integrated into classroom activities to supplement teacher feedback and provide more individualized learning opportunities. In summary, the results of the last section demonstrate that students view AI pronunciation technologies as valuable and effective aids in overcoming common challenges such as

limited practice opportunities, lack of immediate feedback, and persistent pronunciation errors that are difficult to correct through traditional methods. By offering accessible, engaging, and personalized practice, AI technologies significantly contribute to students' confidence and competence in English pronunciation, offering a promising pathway for enhancing language learning outcomes.

Conclusion

Exclusively, the present chapter has been devoted to the practical framework of this research, focusing on the investigation of EFL students' attitudes and experiences regarding the use of Artificial Intelligence (AI) technologies to enhance English pronunciation. Based on the analysis of the questionnaire administered to second-year English students, the findings reveal that most participants are motivated to improve their pronunciation and actively use AI tools such as mobile applications and online platforms. The majority of students acknowledged that AI technologies offer accessible, user-friendly, and affordable solutions, which encourage regular practice and reduce anxiety associated with speaking in front of others. Notably, students highlighted features like instant error correction, interactive exercises, and progress tracking as particularly valuable for identifying and addressing their weaknesses. Furthermore, the immediate and personalized feedback provided by AI tools was seen as instrumental in helping students make noticeable improvements, especially in challenging areas such as linking sounds, intonation, and word stress. Open-ended responses reinforced these results, with many learners recommending wider adoption of AI resources in language instruction. The chapter demonstrates that AI pronunciation technologies are widely regarded as effective aids in enhancing EFL learners' pronunciation. Ultimately, these technologies contribute to greater confidence, motivation, and competence in English pronunciation, supporting students in achieving their language learning goals.

General conclusion

1. Concluding remarks

The central aim of this research is to investigate the potential of artificial intelligence (AI) tools in improving EFL learners' pronunciation. The study focused on second-year students at the Department of Letters and English Language, University 8 May 1945, Guelma, and sought to provide a well-rounded understanding of the topic by examining it from both theoretical and practical grounds. While the initial chapters addressed the theoretical perspective of pronunciation and the AI technological advancements in language education, the final chapter presented a field investigation based on quantitative data collection.

The analysis of the data revealed that students generally perceived AI-assisted pronunciation tools in a positive light. The results demonstrated that the advancements in artificial intelligence have opened new opportunities in the field of language learning, particularly in improving pronunciation. Among these innovations, AI-powered tools have proven to be highly effective in helping learners recognize, practice, and refine their pronunciation in real-time. These technologies provide immediate feedback, allowing students to identify and correct errors efficiently, which in turn builds greater self-awareness and confidence in oral communication. Throughout this research, findings revealed that AI-assisted learning fosters significant improvement in learners' pronunciation accuracy by simulating native-like models and offering individualized guidance.

In addition, the study highlighted several contributing factors that shape students' attitudes towards AI-based pronunciation tools, including their familiarity with technology, prior exposure to digital learning platforms, and the availability of resources. The findings further emphasized the need for modern instructional practices that integrate innovative

technological solutions to address learner needs in foreign language learning better. AI tools emerged as promising alternatives to traditional pronunciation teaching, offering personalized and interactive learning experiences that engage students and foster improvement in pronunciation.

In conclusion, this research helps us understand how AI can be used in language teaching, especially for pronunciation. It supports the idea that teaching should be more flexible and student-centered. Using AI tools in the classroom can help students get better results by giving them feedback, keeping them engaged, and helping them improve their pronunciation in a way that fits their individual needs.

1. Pedagogical implications

The findings of this research have several pedagogical implications for enhancing pronunciation through the integration of AI technologies in language learning:

- Students' pronunciation growth is shaped by individual learning preferences, technological awareness, and personal drive. Teachers can utilize AI tools like speech recognition apps and pronunciation feedback software to address varied learners' needs and encourage individualized learning paths.

- Learners are expected to play an active part in their pronunciation growth by engaging regularly with AI-powered instruments intended to offer personalized feedback. Their dedication to practicing often and acting on the feedback is vital to attaining advancement.

- Students are prompted to establish specific, measurable targets for pronunciation improvement and employ AI-generated analytics to monitor their progress. This reflective practice encourages self-awareness and aids learners in recognizing patterns in their speech that need extra focus.

- Learner's ought to view AI tools not solely as correction instruments but as opportunities for experimentation and development. They have to be prepared to make errors, repeat assignments, and enhance their speech via continued interaction with these technologies.

- Active participants in class discussions and oral activities, both preceding and using AI tools, boost the incorporation of better pronunciation into actual communication. Students should apply the feedback they get from AI to their spoken performance in diverse social and academic scenarios.

- Collaborative learning can further support pronunciation development. Learners are encouraged to share their experiences with AI tools, exchange strategies, and even engage in peer review sessions guided by AI feedback to foster mutual improvement.

- To cultivate learner autonomy, instructors should motivate students to engage actively with AI-based pronunciation tools. Through repeated practice, real-time feedback, and self-monitoring, learners can take command of their progress and build confidence in their speaking abilities.

- AI technologies should be integrated into classroom instruction to supplement traditional teaching methods. Teachers can use these tools to provide immediate corrective feedback, demonstrate accurate pronunciation models, and create interactive speaking tasks that motivate learners.

- Educators ought to try to devise significant pronunciation tasks by connecting practice activities to real-life communication. This can be accomplished by integrating role-plays, simulated conversations, and context-based exercises that mirror genuine language use.

- By fostering a supportive and low-anxiety environment, educators can help students overcome the fear of making mistakes. Encouraging collaborative use of AI tools, such as pair or group activities using language apps, also promotes peer learning and engagement.

- Instructors should introduce AI-based pronunciation tools methodically, providing training sessions or demonstrations to help students understand how to use the tools effectively.

- Educators can promote a blended learning method by merging AI pronunciation exercises with additional language abilities, like oral communication and aural comprehension. This guarantees that pronunciation enhancement contributes to overall communicative proficiency.

3. Research limitation

Like most research endeavors, this study faced some challenges. The primary limitations noticed throughout the research process are:

- One significant hurdle was the difficulty in locating sufficient and pertinent sources. There was a clear lack of academic works centered literature review.

- The research included a comparatively small number of participants, which could impact the generalizability of the findings to other situations or populations due to the increase in absences at the end of the school year.

- Given that an experimental design was not possible, the study had to depend on students' questionnaires as the principal data-gathering method. These replies, being self-reported, might encompass personal biases or errors.

- Time constraints meant the research only concentrated on students' perspectives. This narrow focus could have limited how thorough and comprehensive the results were.

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Appendices
Appendix A
Student's Questionnaire

Dear students,

You are kindly requested to answer the questionnaire below, which is part of the research work for completing a master's dissertation. The questionnaire aims to gather information about the effectiveness of AI Technologies in enhancing English pronunciation skills among students. In this respect, your answers will be used only to serve research purposes.

Ms. THOUR Narimene

Ms. RABACHI Ranim

Department of Letters and English language

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1. What is your gender?

Male	
Female	

2. How old are you?

..... Years

3. Is English your personal choice?

Yes	
No	

4. How would you describe your level in English?

Very good	
Good	
Average	
Bad	

5. Which language skill do you find most difficult?

Reading	
Writing	
Speaking	
Listening	

Why?.....

Section Two: English pronunciation

6. How would you describe your level of pronunciation?

Very good	
Good	
Average	
Bad	

7. Which aspects of pronunciation do you find most difficult?

(Select all that apply.)

Vowel sounds	
Consonant sounds	
Word stress	
Sentence stress	
Intonation (rise and fall of the voice	
Linking sounds (connected speech)	

8. Which factors affect your pronunciation?

Fear of speaking in front of your classmates	
Not motivated to speak English	
Lack of practicing pronunciation activities	
Lack of listening to native speakers	
First language interference	

9. Have you ever received feedback on your pronunciation?

Yes, regularly	
Occasionally	
Rarely	
Never	

10. How often do you practice English pronunciation?

Daily	
Several times a week	
Once a week	
Rarely	
Never	

11. What methods do you use to improve your pronunciation?

Listening to native speakers (e.g., podcasts, TV, YouTube.	
Imitating speech (shadowing technique)	
Using pronunciation apps or software.	
Attending pronunciation classes or workshops.	
Reading aloud	
Recording and listening to yourself	
Getting feedback from a teacher/tutor.	

Others

12. Which resources do you use regularly? (Select all that apply.)

YouTube videos	
Mobile apps (e.g., ELSA Speak, Duolingo)	
Language learning websites	
Textbooks or coursebooks	
Social media (e.g., Instagram, TikTok. T.V)	
English-speaking clubs	

Others

13. Do you think your pronunciation has improved by using these resources?

Yes, a lot	
Yes, a little	
Not sure	
No improvement	

14. If yes, is it because of AI tools?

.....

Section three: AI pronunciation technologies

15. Do you use Artificial Intelligence (AI) tools in English language learning?

Yes	
No	

16. Have you used any AI tools for learning pronunciation?

Yes	
No	

17. If yes, which AI tools do you use?

ELSA speak	
Google speech recognition	
Duolingo	

18. How motivated do you feel to practice pronunciation using AI applications?

More motivated	
About the same	
Less motivated	

19. Which device(s) do you usually use to access AI pronunciation tools?

Smartphone	
Tablet	
Laptop / Desktop	

Other.....

20. In your opinion, how do AI technologies compare to traditional pronunciation practices?

Much better	
Somewhat better	
About the same	
Less effective	
Much less effective	

21. How often do you use AI Tools for pronunciation practice?

Daily	
A Few times a week	
Occasionally	
Rarely	
Never	

22. Do you find AI tools easy to use?

Yes	
No	

23. Have you experienced any technical issues while using AI tools?

Frequently	
Occasionally	
Rarely	
Never	

If yes, which

24. How affordable are the AI tools you use?

Very affordable	
Reasonably priced	
Expensive	
Very expensive	
I only use free tools.	

25. How helpful are AI tools in improving your pronunciation?

Very helpful	
Helpful	
Neutral	
Not very helpful	
Not helpful at all	

26. Which features of AI Tools do you find most effective? (Select all that apply.)

Real-Time feedback	
Voice recognition accuracy	
Repetition and practice	
Visual / Audio comparisons	
Gamified learning	
Progress tracking	

27. Do AI Tools provide clear feedback on your pronunciation mistakes?

Always	
Often	
Sometimes	
Rarely	
Never	

28. How accurately do you think AI tools evaluate your pronunciation?

Very accurate	
Accurate	
Neutral	
Inaccurate	

29. Has your pronunciation improved as a result of using AI tools?

Yes	
No	

30. Feel free to add any further information about the topic

.....

.....

.....

.....

Thank you for your cooperation.

الملخص

شهدت السنوات القليلة الماضية تغيراً جذرياً في مجال التكنولوجيا سواء في السياقات التعليمية أو غير التعليمية. ومن بين هذه التطورات التكنولوجية، أصبحت تقنية الذكاء الاصطناعي في تعلم اللغة الإنجليزية كلغة أجنبية واحدة من أبرز المواضيع التي نوقشت على نطاق واسع، حيث حظيت باهتمام كبير وأصبحت تدمج بشكل متزايد في العملية التعليمية. تهدف الدراسة الحالية إلى فحص فعالية تقنيات الذكاء الاصطناعي في تعزيز مهارات النطق باللغة الإنجليزية لدى الطلاب. وتفترض الفرضية الأساسية المعتمدة في هذه الدراسة أن استخدام تقنيات الذكاء الاصطناعي يساهم في تحسين الكفاءة الشفوية. وقد تم اعتماد المنهج الوصفي الكمي لجمع البيانات من خلال توزيع استبيان على مئة واثنين وأربعين طالباً من طلاب السنة الثانية ليسانس بقسم الآداب واللغة الإنجليزية بجامعة 8 ماي 1945 قالمة. وكشفت نتائج الاستبيان عن وجود موقف إيجابي بشكل عام بين الطلاب تجاه استخدام أدوات الذكاء الاصطناعي لتحسين مهارات النطق لديهم. حيث وافق غالبية المشاركين أو أبدوا موافقة قوية على أن التطبيقات المعتمدة على الذكاء الاصطناعي ساعدتهم في التعرف على أخطائهم في النطق وتصحيحها بشكل أكثر فعالية أثناء أنشطة الكفاءة الشفوية. وتشير هذه النتائج إلى أن الطلاب لا يكتفون بقبول دور الذكاء الاصطناعي في دعم تعلمهم للغة، بل يقدرّون أيضاً أهميته، خاصة في مجال النطق

Le résumé

Ces dernières années ont été marquées par une transformation profonde des technologies, tant dans les contextes éducatifs que non éducatifs. Parmi ces avancées technologiques, l'intelligence artificielle (IA) appliquée à l'apprentissage de l'anglais langue étrangère est devenue un sujet central, suscitant un intérêt croissant et s'intégrant de plus en plus dans les processus pédagogiques. La présente recherche vise à évaluer l'efficacité des technologies d'IA dans le développement des compétences de prononciation en anglais chez les étudiants. L'hypothèse principale de cette étude postule que l'utilisation des technologies d'IA peut améliorer la maîtrise orale. Une méthode descriptive quantitative a été employée, avec la collecte de données via un questionnaire administré à cent quarante-deux étudiants de deuxième année de licence au Département de Lettres et Langue Anglaise de l'Université du 8 Mai 1945 de Guelma. Les résultats du questionnaire ont révélé une attitude globalement positive des étudiants envers l'utilisation des outils d'IA pour améliorer leur prononciation. Une large majorité des répondants ont exprimé leur accord, voire un fort accord, sur le fait que les applications basées sur l'IA les aident à mieux identifier et corriger leurs erreurs de prononciation lors des activités d'expression orale. Ces résultats montrent que les étudiants non seulement acceptent, mais apprécient également le rôle de l'IA dans le soutien.