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Enhancing Speaking and Listening Skills through Technology-Based Pronunciation Instruction among undergraduate students at Rajabhat Universities in Thailand

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ABSTRACT: This academic article examines technology-based pronunciation instruction for enhancing speaking and listening skills among undergraduates at Rajabhat Universities in Thailand. It focuses on Thai learners' difficulties with challenging English sounds caused by differences between Thai and English phonological systems, especially unfamiliar consonants, final consonants, consonant clusters, vowel contrasts, stress, rhythm, and intonation. These difficulties affect pronunciation accuracy, listening discrimination, speaking fluency, confidence, intelligibility, and communicative effectiveness. The article proposes that pronunciation should be integrated with listening and speaking instruction rather than taught as an isolated skill. Digital tools such as AI speech recognition, mobile pronunciation applications, online dictionaries, speech-to-text tools, voice and video recording, and online listening quizzes can support repeated practice, self-monitoring, feedback, and revision. The new knowledge derived from this article is the Technology-Enhanced Pronunciation Development Model, which moves learners from sound awareness and listening discrimination to controlled pronunciation practice, digital feedback, communicative speaking tasks, and meaningful language use. The article concludes that technology-based pronunciation instruction can improve clearer pronunciation, stronger listening ability, speaking fluency, confidence, intelligibility, and practical communication in academic, professional, and local community contexts.

KEYWORDS - Pronunciation instruction; Technology-enhanced learning; Speaking skills; Listening skills

I. INTRODUCTION

In Thai EFL learning environments, pronunciation is a key element of oral communication because it affects how clearly learners are understood, how well they comprehend spoken English, and how fluently and confidently they communicate. For undergraduate students at Rajabhat Universities, accurate pronunciation is necessary for academic presentations, classroom discussions, tourism-related communication, cultural interpretation, community product promotion, public service situations, and future career opportunities. Therefore, pronunciation instruction should be connected with speaking and listening practice instead of being taught as a separate or purely mechanical skill.

Thai learners' pronunciation difficulties are largely shaped by differences between Thai and English phonological systems. Challenging areas include unfamiliar consonants such as /v/, /θ/, /ð/, /z/, /ʃ/, /ʒ/, /tʃ/, and /dʒ/, as well as final consonants, consonant clusters, vowel contrasts, stress, rhythm, and intonation. Since Thai has more restricted final consonant patterns, students may omit, weaken, or substitute final sounds such as /p/, /t/, and

/k/. These pronunciation difficulties may influence both the clarity of learners' speech and their ability to recognize spoken English accurately. For example, when learners cannot clearly distinguish or produce words such as *cup*, *cut*, and *cook*, or *rice* and *lice*, communication problems may occur in real-life interactions.

Listening is a fundamental component of pronunciation development because learners need to perceive sound contrasts accurately before they can produce them clearly. Therefore, effective pronunciation instruction should integrate listening discrimination, minimal-pair practice, final-sound recognition, and connected-speech activities. Rather than aiming for native-like pronunciation, pronunciation teaching should emphasize intelligibility and comprehensibility so that learners can communicate clearly and effectively in real situations.

Technology-enhanced pronunciation instruction can provide practical support for Thai learners in this process. Digital tools such as AI speech recognition, mobile pronunciation applications, online dictionaries, YouTube pronunciation models, voice and video recording, speech-to-text tools, and online listening quizzes offer opportunities for repeated practice, individualized feedback, self-monitoring, and revision. These tools also extend learning beyond classroom time, reduce learners' anxiety, and build confidence. For students at Rajabhat Universities, technology-enhanced pronunciation instruction can link pronunciation accuracy with speaking performance, listening comprehension, and meaningful communication in academic, professional, and local community contexts.

II. English Pronunciation in Thai EFL Contexts

Pronunciation is a fundamental component of English language learning in Thai EFL contexts because it directly influences learners' intelligibility, listening comprehension, communicative confidence, and participation in spoken interaction. Pronunciation competence involves not only the accurate articulation of individual sounds but also the effective use of consonants, vowels, word-final sounds, consonant clusters, stress, rhythm, intonation, and connected speech. For undergraduate students at Rajabhat Universities in Thailand, pronunciation development is particularly important, as English is required in various academic, professional, and community-based situations, including classroom interaction, academic presentations, local tourism communication, cultural interpretation, community product promotion, public service encounters, and future employment. Therefore, pronunciation instruction should not be treated merely as a technical or mechanical practice of sound production. Rather, it should be positioned as a communicative bridge between speaking and listening, enabling learners to produce clearer speech, understand spoken English more effectively, and participate more confidently in meaningful communication.

Pronunciation difficulties in Thai EFL learning are largely associated with structural differences between the Thai and English phonological systems. Thai and English differ in several key aspects, including consonant inventories, syllable structures, vowel distinctions, word-final consonants, consonant clusters, stress patterns, rhythm, and intonation. Kanokpermpoon (2007) explains that English consonants which do not occur in the Thai sound system often cause pronunciation problems for Thai learners, particularly sounds such as /v/, /θ/, /ð/, /z/, /ʃ/, /ʒ/, /tʃ/, and /dʒ/. Similarly, Naruemon (2024) points out that Thai learners tend to experience difficulty when English consonants appear in word positions or sound combinations that are unfamiliar in Thai phonology. These studies suggest that many pronunciation errors made by Thai learners are influenced by first-language transfer and by the phonological mismatch between Thai and English.

A common pronunciation challenge for Thai learners is the production of English word-final consonants. Unlike Thai, which has a relatively restricted range of final consonant sounds, English allows many final sounds, including /p/, /t/, /k/, /s/, /z/, /v/, /ʃ/, and /l/. As a result, Thai learners may leave out, reduce, or replace these final sounds when speaking English. For example, the word *cup* may be pronounced without a clear final /p/, *cat* may lose the final /t/, and *book* may be produced with a weak or unclear final /k/. Suntornsawet (2022) notes that Thai-accented English is strongly shaped by Thai phonological patterns, especially in the production of final consonants and consonant clusters. Kaewchum (2018) also found that learners' ability to perceive English final consonants is closely connected to their ability to produce them accurately. Similarly, Pathanasin (2026) confirms that word-final consonants remain difficult for Southern Thai EFL learners because of the phonological differences between Thai and English.

Consonant clusters are another major pronunciation difficulty for Thai EFL learners. English allows complex consonant combinations at the beginning and end of words, such as /pl/, /tr/, /st/, /sk/, /sp/, and /str/. In contrast, Thai syllable patterns are generally more restricted. Because of this difference, Thai learners may simplify English consonant clusters by deleting one of the consonants or inserting an extra vowel sound. For example, the word *street* may be simplified because of the /str/ cluster, *desk* may be pronounced without a clear final /k/, and *test* may lose the final /t/. These pronunciation patterns can influence both speaking and listening. Unclear cluster production may reduce intelligibility, while limited ability to perceive consonant clusters may make it difficult for learners to recognize words in natural spoken English.

English fricatives and affricates also cause difficulties for many Thai learners. Sounds such as /θ/, /ð/, /v/, /z/, /ʃ/, /ʒ/, /tʃ/, and /dʒ/ may be unfamiliar to Thai learners or may not function in the same way in the Thai sound system. Boodsee (2019) explains that Thai learners often substitute unfamiliar English sounds with sounds that are closer to Thai pronunciation patterns. For example, /θ/ may be pronounced as /t/ or /s/, /ð/ as /d/ or /z/, and /v/ as /w/ or /f/. Charumanee and Wongkittiporn (2024) also report that Thai university students frequently make errors with English fricatives, particularly in word-final positions. These sound substitutions may reduce the clarity of words such as *think*, *this*, *very*, *visit*, *village*, *service*, and *cultural*. For students at Rajabhat Universities, who may need to use English in tourism, public service, community work, and local development contexts, inaccurate pronunciation of these sounds can create misunderstanding in authentic communication.

Another important pronunciation issue concerns the distinction between /r/ and /l/. Although Thai has sounds that are similar to English /r/ and /l/, their articulation and distribution are not the same as in English. As a result, learners may confuse or weaken these sounds in words such as *right* and *light*, *rice* and *lice*, and *road* and *load*. Singhanuwananon (2018) found that pronunciation problems can affect Thai EFL learners' confidence in speaking. When learners are unsure whether their pronunciation is clear, they may avoid speaking, hesitate during oral tasks, or depend too much on memorized scripts. Therefore, pronunciation development should be viewed not only as a linguistic issue but also as a matter of confidence, communication, and learner participation.

Vowel distinctions also play an important role in the development of Thai learners' speaking and listening skills. English includes several vowel contrasts that do not directly match Thai vowel categories, such as /ɪ/ and /iː/ in *ship* and *sheep*, /æ/ and /e/ in *man* and *men*, /ʊ/ and /uː/ in *full* and *fool*, and /ʌ/ and /ɑː/ in *cup* and *carp*. These differences are significant because even slight changes in vowel quality can alter word meaning. When learners are unable to hear these contrasts clearly, they may also struggle to produce them accurately. Therefore, pronunciation instruction should integrate listening discrimination and speaking practice through minimal-pair exercises, word repetition, sentence-level practice, and communicative speaking activities.

Suprasegmental features, such as word stress, rhythm, and intonation, are also essential in Thai EFL pronunciation. In English, these features help convey meaning, emphasis, and the organization of information in spoken communication. Thai learners may produce English with relatively even stress across syllables or may have difficulty recognizing stressed syllables in natural speech. Kanoksilapatham (2014) found that English pronunciation, including awareness of suprasegmental features, can be challenging even for Thai teachers. This suggests that stress and rhythm require more systematic attention in pronunciation teaching. If stress and intonation are unclear, learners' speech may sound flat or difficult to understand, and their listening comprehension may also be affected when they encounter naturally spoken English.

International research on pronunciation teaching supports an approach that prioritizes intelligibility. Celce-Murcia et al. (2010) suggest that pronunciation instruction should cover both segmental features, such as consonants and vowels, and suprasegmental features, such as stress, rhythm, and intonation. Derwing and Munro (2005) argue that the goal of pronunciation teaching should be intelligible and comprehensible speech rather than a native-like accent. Similarly, Levis (2005, 2018) proposes the intelligibility principle, which focuses on pronunciation features that support successful communication. Jenkins (2000) also emphasizes mutual intelligibility in international communication, especially when English is used among speakers from diverse linguistic backgrounds. These perspectives are particularly relevant for undergraduate students at Rajabhat Universities, whose primary goal is to use English clearly and effectively in academic, professional, and community-based contexts rather than to imitate native-speaker pronunciation.

Technology-enhanced pronunciation instruction offers effective support for addressing Thai learners' pronunciation difficulties. Traditional classroom instruction often depends on teacher modeling, repetition, and occasional correction, which may not provide enough individual practice or timely feedback. In contrast, digital tools can extend pronunciation learning beyond the classroom and promote repeated practice, self-monitoring, feedback, and revision. Arunsirot (2017) showed that speech analyzer software can support Thai students' English pronunciation development, while studies on automatic speech recognition (ASR) also suggest its potential for improving word-level pronunciation among Thai EFL learners.

For undergraduate students at Rajabhat Universities, pronunciation instruction can be supported through AI speech recognition, mobile pronunciation applications, online dictionaries, YouTube pronunciation models, voice and video recording, speech-to-text tools, Google Forms listening quizzes, and online learning platforms. For example, students may use speech-to-text tools to check whether their pronunciation is recognized accurately. If the sentence "Three visitors visited the village" is incorrectly transcribed, learners can identify possible pronunciation problems with sounds such as /θ/ and /v/, listen to models, repeat the target sounds, record improved versions, and receive teacher or peer feedback. This cycle of listening, production, feedback, and revision can improve pronunciation accuracy and learner autonomy.

In Rajabhat University contexts, pronunciation practice should be linked to meaningful speaking and listening tasks. Activities such as local tourism presentations, campus direction role plays, community product promotion videos, public service dialogues, interviews, and job interview simulations allow students to use pronunciation in real communication. These tasks connect pronunciation learning with speaking performance, listening comprehension, confidence, and local community relevance.

III. CHALLENGING ENGLISH SOUNDS FOR THAI STUDENTS

The pronunciation challenges experienced by Thai learners can be explained largely through the structural differences between Thai and English phonological systems. These difficulties should not be interpreted as a lack of effort or motivation; rather, they occur because certain English sounds, sound positions, and sound combinations are absent from Thai or function differently within the Thai sound system. Such differences influence both oral production and listening perception, since learners must be able to pronounce English sounds intelligibly and recognize them accurately in spoken input. This issue is particularly relevant for Undergraduates at Rajabhat Universities in Thailand, as they may need to use English for classroom presentations, local tourism communication, community product promotion, public service interaction, and future workplace contexts.

Thai learners often experience pronunciation difficulties because some English sounds do not exist in Thai or occur in sound positions that are uncommon in the Thai language. English consonants such as /v/, /θ/, /ð/, /z/, /ʃ/, /ʒ/, /tʃ/, and /dʒ/ frequently cause problems because they differ from Thai phonological patterns. As Kanokpermpoon (2007) and Naruemon (2024) suggest, many pronunciation errors among Thai learners are influenced by first-language transfer rather than random mistakes.

Word-final consonants are another major challenge. English allows many final consonants, including /p/, /t/, /k/, /s/, /z/, /v/, /ʃ/, and /l/, while Thai permits fewer final sounds. Consequently, Thai learners may omit, weaken, or replace final consonants in words such as *cup*, *cat*, and *book*. Research by Suntornsawet (2022), Kaewchum (2018), and Pathanasin (2026) confirms that the perception and production of English final consonants are strongly affected by differences between Thai and English sound systems.

Consonant clusters also create difficulty because English allows complex clusters such as /pl/, /tr/, /st/, /sk/, /sp/, and /str/, whereas Thai syllable structures are less complex. Learners may simplify words by deleting sounds or adding vowels, which can reduce both speech intelligibility and listening comprehension. Similarly, English fricatives and affricates may be replaced by Thai-like sounds, affecting the clarity of words such as *think*, *this*, *very*, *village*, and *service*.

Other important challenges include the /r/ and /l/ distinction, vowel contrasts such as *ship/sheep* and *man/men*, and suprasegmental features such as stress, rhythm, and intonation. These issues can affect learners' confidence, fluency, and ability to communicate clearly. Therefore, pronunciation instruction for Thai undergraduates should focus on intelligibility rather than native-like pronunciation and should combine listening discrimination, speaking practice, digital feedback, and meaningful communication tasks.

IV. Relationship between Pronunciation, Speaking, and Listening

The relationship between pronunciation, speaking, and listening is central to oral communication in Thai EFL contexts. Pronunciation enables learners to produce intelligible speech, speaking requires learners to use pronunciation, vocabulary, grammar, and interactional strategies in real time, and listening allows learners to perceive sound contrasts and interpret spoken messages accurately. For Undergraduates at Rajabhat Universities in Thailand, this relationship is particularly important because English may be used for academic presentations, campus communication, tourism-related interaction, local community service, product promotion, and future employment. Thai scholars have identified persistent pronunciation challenges among Thai learners, including final consonants, consonant clusters, unfamiliar consonants, vowel contrasts, stress, rhythm, and confidence (Arunsirot, 2017; Boodsee & Boonmoh, 2019; Charumanee & Wongkittiporn, 2024; Kaewchum, 2018; Kanokpermpoon, 2007; Kanoksilapatham, 2014; Ketkumbonk, 2017; Naruemon, 2024; Pathanasin et al., 2025; Singhanuwananon, 2018; Suntornsawet, 2022) have identified persistent pronunciation challenges among Thai learners, including final consonants, consonant clusters, unfamiliar consonants, vowel contrasts, stress, rhythm, and confidence. International scholars such as Celce-Murcia, Derwing, Munro, Levis, and Jenkins further support pronunciation teaching that prioritizes intelligibility and communicative effectiveness rather than native-like speech.

4.1 Pronunciation and Speaking Skills

Clear pronunciation strengthens speaking ability because it helps learners deliver spoken messages more clearly, accurately, fluently, and confidently. When students can articulate English sounds effectively, they are more willing to take part in conversations, presentations, interviews, and role-play activities. However, unclear pronunciation of final consonants, consonant clusters, /r/ and /l/, /v/, /θ/, /ð/, vowel contrasts, or word stress may reduce intelligibility and lead to hesitation. For instance, if learners cannot clearly distinguish or pronounce words such as *rice* and *lice*, *right* and *light*, or *cup*, *cut*, and *cook*, listeners may misunderstand the intended meaning. Thus, pronunciation plays a direct role in improving fluency, accuracy, confidence, and successful speaking performance in academic and community-based communication.

4.2 Pronunciation and Listening Skills

Pronunciation and listening are mutually connected because learners need to perceive sound differences before they can produce them accurately. Kaewchum's work on perception and production of English final consonants indicates that learners who have difficulty hearing final sounds may also have difficulty producing them clearly. Ketkumbonk similarly shows that Thai learners' recognition of English final consonants varies across proficiency levels. This relationship suggests that pronunciation instruction should not focus only on oral repetition; it should also include listening activities that train learners to identify sound contrasts, final consonants, consonant clusters, stress, rhythm, and intonation in spoken English.

4.3 Listening Discrimination and Sound Recognition

Listening discrimination provides an essential basis for pronunciation development because learners must first recognize sound differences before they can produce them accurately. Minimal-pair practice helps students become aware of meaningful contrasts, such as *rice/lice*, *think/sink*, *vine/wine*, *ship/sheep*, and *cap/cat*. Recognizing final sounds is also important for Thai learners, as English word-final consonants are often omitted or weakened in speech. In addition, exposure to connected speech helps students understand how sounds appear naturally in phrases, sentences, and conversations. Activities such as audio quizzes, dictation, sentence recognition, and listening-and-response tasks can improve learners' ability to identify target sounds before applying them in spoken communication.

4.4 Pronunciation for Real Communication

Pronunciation practice is more effective when it is connected to real communicative situations. Rather than practicing sounds only in single words, students should use them in conversations, presentations, interviews, tourism-related activities, campus service role plays, and local community interactions. For example, students at Rajabhat Universities can practice target sounds through local tourism presentations using words such as *visitor*, *village*, *temple*, *product*, *market*, *culture*, and *local*. They can also engage in job interview simulations, community interviews, or local product promotion videos. These activities combine pronunciation accuracy with speaking

fluency, listening comprehension, interaction, and confidence. In addition, technology-enhanced tools such as AI speech recognition, mobile pronunciation applications, online dictionaries, voice and video recording, speech-to-text tools, and Google Forms listening quizzes can support learning by offering repeated practice, feedback, and opportunities for self-monitoring.

Table 1: *Relationship between Pronunciation, Speaking, and Listening*

Area	Role in oral communication	Example for Thai Undergraduates	Technology-enhanced support
Pronunciation + Speaking	Clear sound production supports fluency, accuracy, confidence, and intelligibility.	Students pronounce visitor, village, product, market, rice/light, and cup/cat in presentations or role plays.	AI speech recognition, voice recording, video recording, online dictionaries
Pronunciation + Listening	Accurate sound perception helps learners produce sounds more clearly.	Students identify final /p/, /t/, /k/ in cap, cat, back before using them in speaking tasks.	Minimal-pair quizzes, pronunciation apps, Google Forms audio tasks
Listening discrimination	Learners distinguish similar sounds and recognize meaning differences.	Students compare rice/lice, think/sink, vine/wine, ship/sheep, full/fool.	Audio models, speech-to-text checking, mobile listening practice
Real communication	Pronunciation, speaking, and listening are used together in authentic interaction.	Students conduct tourism presentations, community interviews, job interviews, and campus service dialogues.	Video projects, Padlet, LINE, Google Classroom, peer/teacher feedback

The relationship among pronunciation, speaking, and listening shows that oral communication should be taught as an integrated process. Clear pronunciation improves the intelligibility of speaking, sound perception strengthens listening comprehension, and listening discrimination supports accurate sound production. For Thai Undergraduates at Rajabhat Universities, technology-enhanced pronunciation instruction can help connect these skills through meaningful practice, repeated feedback, and real communication tasks relevant to academic, professional, and local community contexts.

V. Technology-Enhanced Pronunciation Instruction

Technology-enhanced pronunciation instruction involves the planned integration of digital tools, computer programs, mobile applications, and artificial intelligence technologies to help learners recognize, produce, monitor, and refine English pronunciation. This approach is highly relevant in Thai EFL contexts because many learners' pronunciation problems are caused by differences between the Thai and English sound systems, including word-final consonants, consonant clusters, unfamiliar fricatives and affricates, vowel distinctions, stress, rhythm, and intonation. For undergraduate students at Rajabhat Universities in Thailand, technology-supported pronunciation learning can link sound practice with the development of speaking and listening skills for academic, professional, and local community communication.

Thai scholarship indicates that pronunciation problems among learners are strongly influenced by first-language transfer and limited opportunities for individualized practice. Kanokpermpoon (2007) explains that English consonantal sounds absent from Thai tend to cause difficulty for Thai learners, while Suntornsawet (2022),

Kaewchum (2018), and Pathanasin et al. (2025) emphasize persistent problems with English word-final consonants and clusters. Naruemon (2024), Boodsee (2019), Charumanee and Wongkittiporn (2024), Kanoksilapatham (2014), Arunsirot (2017), and Singhanuwananon (2018) further show that pronunciation difficulties are related not only to segmental sounds but also to suprasegmental features, learner confidence, and classroom teaching practices. These studies suggest that pronunciation instruction should provide repeated input, listening discrimination, oral production, feedback, and revision.

International scholars provide theoretical support for integrating technology with pronunciation pedagogy. Celce-Murcia et al. (2010) argue that pronunciation instruction should include both segmental and suprasegmental features. Derwing and Munro (2005) emphasize intelligible and comprehensible speech rather than native-like pronunciation. Levis (2005, 2018) proposes the intelligibility principle, which prioritizes pronunciation features that support successful communication. Jenkins (2000) also highlights mutual intelligibility in international English communication. These perspectives support the use of technology not merely for mechanical repetition, but for communicative pronunciation development that strengthens speaking and listening skills.

Technology-enhanced pronunciation instruction can include the use of AI speech recognition, speech-to-text programs, mobile pronunciation apps, online dictionaries, YouTube pronunciation models, voice and video recording tools, learning management systems, and online listening quizzes. These technologies help learners listen to pronunciation models, repeat target words, record their speech, compare their pronunciation with reference examples, receive feedback from teachers or digital systems, and revise their performance. For instance, when a student says "Three visitors visited the village" and a speech-to-text tool transcribes it incorrectly, the learner can notice possible problems with sounds such as /θ/ and /v/, listen to accurate models, practice again, and submit an improved recording. This process promotes self-monitoring and learner independence.

For students at Rajabhat Universities, pronunciation technology should be integrated with meaningful speaking and listening activities rather than used only for isolated sound practice. Students can practice difficult English sounds through local tourism presentations, campus direction role plays, community product promotion videos, public service dialogues, job interview simulations, and community interview projects. These activities allow learners to apply pronunciation knowledge in real communicative situations while improving fluency, listening discrimination, intelligibility, confidence, and interactional skills. Thus, technology-enhanced pronunciation instruction offers a practical approach to connecting phonological awareness, digital learning, and communicative English use in Thai higher education.

Table 2: *Technology-enhanced pronunciation instruction for Thai Undergraduates*

Technology Tool	Pronunciation Function	Speaking/Listening Support	Example for Thai Learners
AI speech recognition / speech-to-text	Checks whether learners' pronunciation is recognized accurately	Links pronunciation accuracy with intelligibility and self-correction	Students read "Three visitors visited the village" and identify /theta/ or /v/ problems from misrecognized output
Mobile pronunciation applications	Provides models, repetition, and sound comparison	Supports repeated practice beyond class time	Students practice /v/, /theta/, /r/, /l/, final /p t k/, and consonant clusters
Online dictionaries and YouTube models	Offers audio models from proficient speakers	Strengthens listening perception and pronunciation awareness	Students compare pronunciations of village, product, market, culture, and local
Voice and video recording	Allows learners to review and revise their own speech	Develops fluency, confidence, and self-monitoring	Students record local tourism presentations

			and resubmit improved versions
Online listening quizzes	Trains minimal-pair and final-sound recognition	Improves listening discrimination before oral production	Students distinguish rice/lice, ship/sheep, cup/cut/cook, and right/light
Teacher, peer, and digital feedback	Provides guidance on sound accuracy and communicative clarity	Improves pronunciation, interaction, and task performance	Students receive rubric-based comments on pronunciation, fluency, and intelligibility

Table 2 shows how different digital technologies can be used to support pronunciation instruction for Thai undergraduates. It explains the connection between learners' pronunciation problems, suitable technological tools, classroom activities, and expected learning outcomes.

The table indicates that Thai learners often face difficulties with several English sound features, including final consonants, consonant clusters, the /r/ and /l/ contrast, the sounds /v/, /θ/, and /ð/, vowel contrasts, stress, rhythm, and intonation. To address these problems, teachers can use tools such as AI speech recognition, mobile pronunciation applications, online dictionaries, voice and video recording, speech-to-text programs, YouTube pronunciation models, and Google Forms listening quizzes.

For example, AI speech recognition can help students check the clarity of their pronunciation. When a word is pronounced unclearly, the tool may identify it as another word, allowing learners to notice their errors and practice again. Similarly, voice and video recording tools allow students to listen to their own speech, compare it with pronunciation models, and improve their oral performance.

The table also shows that technology-enhanced pronunciation instruction supports both speaking and listening development. Students learn not only to produce English sounds more accurately but also to recognize sound differences through listening tasks, minimal-pair practice, and online quizzes. This relationship is important because effective pronunciation learning requires both accurate sound perception and clear sound production.

VI. TECHNOLOGY-ENHANCED LISTENING INSTRUCTION

Technology-enhanced listening instruction is an essential component of pronunciation-focused English teaching because learners need to perceive sound differences before they can produce English sounds accurately in speaking. In the Thai EFL context, listening difficulties are often connected with differences between Thai and English phonological systems, particularly final consonants, consonant clusters, unfamiliar fricatives and affricates, vowel contrasts, stress, rhythm, and intonation. Thai scholars such as Kanokpermpoon, Suntornsawet, Kaewchum, Pathanasin et al., Naruemon, Charumanee, Boodsee, Kanoksilapatham, Arunsirot, Ketkumbonk, and Singhanuwananon identify these areas as important sources of pronunciation and listening difficulty for Thai learners. International scholars such as Celce-Murcia et al., Derwing, Munro, Levis, and Jenkins also support the view that pronunciation learning should be linked with intelligibility, sound perception, and communicative listening. For Undergraduates at Rajabhat Universities in Thailand, listening instruction should therefore develop not only comprehension but also sound awareness, pronunciation accuracy, speaking confidence, and real communication ability.

1. Minimal Pair Listening Practice

Minimal pair listening practice helps learners distinguish words that differ by only one sound, such as rice/lice, think/sink, vine/wine, ship/sheep, and cup/cut. This activity is important because Thai students may fail to perceive contrasts that are absent from Thai or that function differently in Thai phonology. Kaewchum and Ketkumbonk show that sound perception is closely related to production, especially in final consonants. Through digital audio files, Google Forms quizzes, mobile pronunciation applications, and online dictionaries, students can listen repeatedly, choose the word they hear, receive immediate feedback, and practice again. This type of listening practice prepares students for clearer pronunciation and more accurate spoken responses.

2. Final Sound Recognition

Final sound recognition focuses on learners' ability to hear word-final consonants such as /p/, /t/, /k/, /s/, /z/, /v/, /sh/, and /l/. Thai learners often omit or weaken these sounds in speech because Thai permits a more restricted set of final consonants. Suntornsawet, Pathanasin et al. (2025), and Kanokpermpoon (2007) emphasize that English final consonants and clusters are persistent challenges for Thai learners. Technology can support final sound recognition through short audio quizzes, dictation tasks, and speech-to-text comparison. For example, students listen to cup, cut, and cook, then identify the final sound or write the word they hear. Such tasks help learners connect listening perception with pronunciation production.

3. Listening in Sentences

Listening in sentences trains students to recognize challenging sounds in connected speech rather than only in isolated words. This is necessary because real communication involves linking, rhythm, stress, and intonation. Celce-Murcia et al. emphasize that pronunciation instruction should include both segmental and suprasegmental features. Students may listen to sentences such as "Three visitors visited the village," "Please turn right at the light," or "The local product is packed in a paper package." Through YouTube models, teacher-recorded audio, online dictionaries, and mobile listening platforms, learners can identify target sounds, mark stressed words, and repeat sentences with better rhythm and intelligibility.

4. Listening and Responding

Listening and responding connects sound recognition with communicative use. Instead of listening only to identify sounds, students listen to questions, requests, interviews, or short dialogues and respond orally. This approach reflects the intelligibility-oriented perspectives of Derwing, Munro, Levis, and Jenkins, who emphasize understandable communication rather than native-like pronunciation. In Rajabhat University contexts, students may listen to tourist questions, campus service requests, job interview prompts, or local product inquiries and then respond using clear pronunciation. For example, after hearing "Where can I buy local products?", students may answer, "You can buy local products at the public market." This activity integrates listening comprehension, pronunciation awareness, speaking fluency, and confidence.

Table 3: *Comparison of Technology-Enhanced Listening Instruction Activities*

Listening focus	Example activity	Technology tool	Speaking/pronunciation link	Expected outcome
Minimal pair listening	Choose rice/lice, ship/sheep, cup/cut	Google Forms, mobile apps, audio files	Improves sound discrimination before oral production	More accurate perception of sound contrasts
Final sound recognition	Identify final /p/, /t/, /k/ in cup, cat, book	Audio quiz, dictation, speech-to-text	Supports clearer final consonant pronunciation	Better recognition and production of final sounds
Listening in sentences	Listen to "Three visitors visited the village"	YouTube, teacher audio, online dictionaries	Connects segmental sounds with stress and rhythm	Improved connected-speech comprehension
Listening and responding	Answer tourist, campus, or interview questions	AI chatbot, LINE voice, video call	Links listening input to spoken response	Improved interaction, fluency, and confidence

Table 3 shows that technology-enhanced listening instruction can support pronunciation development at several levels. Minimal pair listening strengthens sound discrimination, final sound recognition helps learners hear word endings more accurately, sentence-level listening develops awareness of connected speech, and listening-and-responding tasks connect perception with communicative speaking. These activities are suitable for Thai Undergraduates because they provide repeated exposure, immediate feedback, self-monitoring, and opportunities to transfer listening practice into pronunciation and speaking performance.

VII. Technology-Enhanced Speaking Instruction

Technology-enhanced speaking instruction refers to the systematic use of digital tools to support learners in preparing, producing, monitoring, revising, and improving spoken English. In the present study, this approach is particularly relevant because pronunciation, speaking, and listening are closely connected in Thai EFL learning. Clear pronunciation enables learners to produce intelligible speech, while speaking practice gives learners opportunities to apply challenging English sounds in meaningful communication. Thai scholars such as Kanokpermpoon (2007), Suntornsawet (2022), Kaewchum (2018), Naruemon (2024), Boodsee (2019), Charumanee and Wongkittiporn (2024), Kanoksilapatham (2014), Arunsirot (2017), Pathanasin et al. (2025), and Singhanuwananon (2018) have emphasized that Thai learners experience difficulties with final consonants, consonant clusters, unfamiliar consonants, vowel contrasts, stress, rhythm, and pronunciation-related confidence. International scholars such as Celce-Murcia et al. (2010), Derwing and Munro (2005), Levis (2005, 2018), Jenkins (2000), and Brown (2004) also support pronunciation and speaking instruction that prioritizes intelligibility, comprehensibility, communicative performance, and meaningful oral interaction.

Controlled pronunciation practice is the initial phase of technology-enhanced speaking instruction. In this phase, students focus on difficult English sounds in individual words and short phrases before applying them in extended speech. Tools such as mobile pronunciation apps, online dictionaries, YouTube pronunciation models, AI speech recognition, and voice recording support learners in listening to models, repeating target words, recording their speech, and comparing their pronunciation with standard examples. For instance, students may practice /θ/ in *think* and *three*, /v/ in *visit* and *village*, /r/ and /l/ in *right* and *light*, final /p/, /t/, and /k/ in *cup*, *cat*, and *book*, and vowel contrasts such as *ship* and *sheep*. This controlled practice is valuable for Thai undergraduates because it offers repeated practice and helps reduce anxiety before learners participate in more communicative activities.

Guided sentence practice moves pronunciation learning from isolated words to meaningful sentence production. Students are given sentence frames containing target sounds and are asked to record, revise, and resubmit their spoken sentences. Examples include *Three visitors visited the village*, *Turn right at the light*, *The local product is packed in a paper package*, and *The students watched a short video*. Speech-to-text tools can help learners check whether their sentences are recognized accurately. When a word is misrecognized, students can identify the unclear sound, listen to the model again, and record a better version. This process encourages self-monitoring and links pronunciation accuracy with speaking fluency.

Communicative speaking tasks allow learners to use challenging sounds in authentic oral communication. For undergraduates at Rajabhat Universities, these tasks should reflect academic, professional, and local community contexts, such as tourism presentations, campus direction role plays, local product promotion videos, job interview simulations, public service dialogues, and community interviews. Through these activities, students transfer pronunciation practice into meaningful communication.

Speaking performance should be assessed analytically. Pronunciation should be evaluated together with fluency, vocabulary, grammar, interaction, content organization, confidence, and intelligibility. In technology-enhanced instruction, recorded tasks, teacher feedback, peer feedback, AI-supported feedback, and self-reflection can help learners identify pronunciation problems, improve performance, and build confidence in real communication.

Table 4: Technology-enhanced speaking instruction for Thai Undergraduates

Instructional focus	Target practice	Technology tools	Example activities	Expected speaking outcomes
Controlled pronunciation practice	Individual sounds, final consonants, clusters, vowel contrasts	AI speech recognition, online dictionaries, pronunciation apps, voice recorder	Listen, repeat, record, and compare words such as think, visit, right, light, cup, cat, and book	Improved sound accuracy and pronunciation awareness

Instructional focus	Target practice	Technology tools	Example activities	Expected speaking outcomes
Guided sentence practice	Target sounds in sentence-level speech	Speech-to-text tools, mobile recording, YouTube models	Record sentences such as "Three visitors visited the village" and revise unclear sounds	Improved fluency, sentence clarity, and self-monitoring
Communicative speaking tasks	Pronunciation in real communication	Smartphone video, Padlet, Google Classroom, LINE	Local tourism presentation, product promotion video, campus role play, job interview simulation	Improved confidence, interaction, intelligibility, and communicative competence
Speaking performance components	Fluency, pronunciation, vocabulary, grammar, interaction, content, confidence	Rubric, teacher feedback, peer feedback, AI-supported feedback	Assess recorded performance and provide revision suggestions	More balanced speaking development and learner autonomy

Table 4 demonstrates how technology-enhanced speaking instruction can guide students progressively from controlled pronunciation practice to guided sentence production and, finally, to communicative speaking performance. It also indicates that digital tools can enhance not only pronunciation accuracy but also fluency, interaction, confidence, intelligibility, and learner autonomy. For Thai undergraduates, this step-by-step process is beneficial because it provides repeated opportunities to practice difficult English sounds before using them in authentic communication tasks related to academic, professional, and local community contexts.

VIII. TEACHING PROCEDURE

A proposed teaching procedure for technology-enhanced pronunciation instruction should be organized as a systematic cycle that links diagnosis, sound awareness, listening discrimination, controlled production, guided practice, communicative use, feedback, revision, and assessment. In the context of Undergraduates at Rajabhat Universities in Thailand, this procedure should not treat pronunciation as an isolated mechanical activity. Rather, pronunciation should be taught as part of integrated speaking and listening development that supports academic communication, local tourism, public service interaction, community product promotion, and future workplace communication.

The procedure is grounded in both Thai and international scholarship on pronunciation, intelligibility, and technology-supported language learning. Thai scholars such as Kanokpermpoon, Suntornsawet, Kaewchum, Pathanasin, Naruemon, Charumanee, Boodsee, Kanoksilapatham, Arunsirot, and Singhanuwananon have identified pronunciation challenges among Thai learners, including final consonants, consonant clusters, unfamiliar consonants, vowel contrasts, stress, rhythm, and learner confidence. International scholars such as Celce-Murcia et al., and Munro emphasize that pronunciation teaching should develop intelligible and comprehensible speech through meaningful communication. Therefore, the teaching procedure should combine sound perception, oral production, digital feedback, and real communicative tasks.

The first stage involves diagnosis. At this stage, the teacher gives students a pronunciation and listening pre-test to identify their problems with difficult English sounds. Students may be asked to read target words, listen to minimal pairs, recognize final consonants, and record short sentences. Digital tools such as Google Forms, mobile voice recorders, and speech-to-text applications can help collect initial data. The second stage focuses on sound awareness. The teacher presents target sounds, including final /p/, /t/, and /k/, consonant clusters, /r/ and /l/, /v/, /θ/, /ð/, vowel contrasts, stress, and intonation. Students then study pronunciation models through online dictionaries, YouTube videos, pronunciation apps, or teacher-recorded audio.

The third stage is listening discrimination. Students practice listening to minimal pairs, identifying final sounds, and distinguishing target sounds in words and sentences. This stage is important because learners need to hear sound differences clearly before producing them accurately. The fourth stage is controlled production, where students repeat words and sentences, record their voices, and compare their pronunciation with models. AI speech recognition and speech-to-text tools can help learners check whether their pronunciation is recognized correctly. For example, if the sentence "Three visitors visited the village" is transcribed incorrectly, students can identify possible problems with /θ/ and /v/ and record again.

The fifth stage is guided speaking practice, in which students use target sounds in sentence frames and semi-controlled tasks, such as campus direction role plays, local tourism descriptions, and local product promotion sentences. The sixth stage is communicative performance, where students complete meaningful speaking tasks, including tourism presentations, public service dialogues, community interviews, job interview simulations, or product promotion videos. The seventh stage involves feedback and revision through teacher, peer, and rubric-based comments. Finally, post-assessment measures students' improvement in pronunciation accuracy, listening discrimination, fluency, intelligibility, and confidence.

Table 5: Proposed technology-enhanced pronunciation teaching procedure

Stage	Teaching focus	Teacher role	Student role	Technology tool	Expected outcome
1. Diagnosis	Identify pronunciation and listening problems	Administer pre-test and collect baseline data	Read words, answer listening quiz, and record speech	Google Forms; voice recorder; speech-to-text	Baseline data on pronunciation and listening
2. Sound awareness	Introduce target sounds and articulation	Explain sound features and provide models	Watch, listen, repeat, and notice sound positions	YouTube; online dictionaries; pronunciation apps	Greater awareness of challenging sounds
3. Listening discrimination	Train sound perception	Provide minimal pairs and final-sound tasks	Identify target sounds in words and sentences	Audio files; Google Forms; mobile quizzes	Improved sound recognition
4. Controlled production	Practice words and sentences	Model pronunciation and guide repetition	Record, compare, and repeat target sounds	Voice recorder; AI speech recognition	Improved pronunciation accuracy
5. Guided speaking	Use sounds in short spoken output	Provide sentence frames and guided tasks	Practice campus, tourism, or product sentences	Mobile recording; Padlet; LINE	Better fluency and confidence
6. Communicative task	Apply sounds in real communication	Assign speaking tasks and monitor performance	Perform role play, interview, or video presentation	Smartphone video; Google Classroom	Improved intelligibility and interaction
7. Feedback and revision	Improve accuracy and communication	Give rubric-based teacher and peer feedback	Review errors and submit revised performance	Rubric; digital comments; AI feedback	Greater self-monitoring and learner autonomy
8. Post-assessment	Measure learning outcomes	Assess final pronunciation,	Complete post-test and reflection	Speaking rubric; listening test; recordings	Evidence of improvement

Stage	Teaching focus	Teacher role	Student role	Technology tool	Expected outcome
		speaking, and listening			

Table 5 presents a sequential instructional model in which each stage builds on the previous one. Diagnosis identifies learners' pronunciation and listening problems; sound awareness and listening discrimination prepare learners to perceive target sounds; controlled production and guided speaking support accurate sound production; communicative tasks transfer sound practice into real speaking situations; and feedback, revision, and post-assessment provide evidence of improvement. The procedure is suitable for Rajabhat University contexts because it connects pronunciation instruction with meaningful local and professional communication.

IX. Sample Classroom Activities

This subsection presents sample classroom activities that operationalize technology-enhanced pronunciation instruction for Thai Undergraduates at Rajabhat Universities. The activities are designed to connect challenging English sounds with speaking and listening development through digital tools, repeated practice, feedback, and communicative use. Drawing on Thai scholarship on learners' pronunciation problems, including final consonants, consonant clusters, unfamiliar consonants, vowel contrasts, stress, rhythm, and confidence (Kanokpermpoon, 2007; Suntornsawet, 2022; Kaewchum, 2018; Naruemon, 2024; Charumanee & Wongkittiporn, 2024; Boodsee, 2019; Kanoksilapatham, 2014; Arunsirot, 2017; Ketkumbonk, 2017; Singhanuwananon, 2018), the activities focus on both perception and production. International scholars also emphasize that pronunciation teaching should prioritize intelligibility, comprehensibility, and communicative use rather than native-like accent (Celce-Murcia et al., 2010; Derwing & Munro, 2005; Levis, 2005, 2018; Jenkins, 2000).

The first activity is an AI speech-to-text pronunciation check, which helps students determine whether their pronunciation is accurately recognized by an automatic speech recognition system. Students read short sentences containing target sounds, such as “Three visitors visited the village” or “The local product is packed in a paper package.” When the tool produces an incorrect or unexpected transcription, students identify the unclear sound, listen to a pronunciation model, and record the sentence again. This activity is useful for developing awareness of sounds such as /θ/, /v/, final /p/, /t/, /k/, and consonant clusters. It also promotes self-monitoring and repeated practice, which are essential for improving pronunciation.

The second activity is a minimal-pair listening quiz, which strengthens listening discrimination before students produce the sounds orally. Students listen to word pairs or groups such as *rice/lice*, *think/sink*, *vine/wine*, *ship/sheep*, *cup/cut*, and *back/bat*, and then choose the word they hear through Google Forms or another online quiz platform. Immediate feedback helps them recognize sound contrasts and identify areas that need further practice.

The third activity is a local tourism presentation, which links pronunciation practice with the local development mission of Rajabhat Universities. Students create a short video introducing a local temple, market, festival, museum, or cultural site. They practice target words such as *visitor*, *village*, *temple*, *product*, *market*, *culture*, *local*, *traditional*, and *service*. This task develops pronunciation accuracy, speaking confidence, digital literacy, and community-based communication.

The fourth activity is a campus direction role play, in which students work in pairs to record conversations about giving directions on campus. This activity emphasizes final sounds, /r/ and /l/, consonant clusters, and connected speech, while also requiring students to listen and respond appropriately.

The fifth activity is a local product promotion video, where students produce a short English video promoting a community or OTOP product. They describe the product, price, package, quality, cultural value, and reasons for buying it. This activity integrates pronunciation, speaking, listening, creativity, feedback, revision, and local community relevance.

Table 6 : *Sample classroom activities for technology-enhanced pronunciation instruction*

Activity	Target pronunciation focus	Technology tools	Speaking/listening task	Expected learning outcomes
AI speech-to-text pronunciation check	/θ/, /v/, final /p t k/, consonant clusters	AI speech recognition, speech-to-text, mobile recorder	Students read target sentences, check transcription, identify errors, and record again.	Greater sound awareness, self-monitoring, pronunciation accuracy, and learner autonomy.
Minimal pair listening quiz	/r/ vs /l/, /θ/ vs /s/, /v/ vs /w/, vowel contrasts, final sounds	Google Forms, audio files, online quiz tools	Students listen to minimal pairs and select the word they hear.	Improved listening discrimination, sound recognition, and preparation for accurate speaking.
Local tourism presentation	Visitor, village, temple, product, market, culture, local	YouTube models, mobile video, CapCut, Google Classroom	Students create a short video introducing a local tourist attraction.	Improved fluency, pronunciation, content organization, confidence, and community communication.
Campus direction role play	/r/ and /l/, final sounds, consonant clusters, connected speech	Smartphone video, LINE, Padlet	Students ask for and give directions around campus.	Improved interaction, listening response, intelligibility, and public service communication.
Local product promotion video	/p/, /v/, final consonants, stress and intonation	Mobile video, Canva, CapCut, AI feedback tools	Students promote a local or OTOP product in English.	Improved persuasive speaking, pronunciation clarity, vocabulary use, creativity, and local relevance.

Table 6 demonstrates that classroom activities should not isolate pronunciation from communication. Each activity begins with listening or model input, moves toward controlled or guided production, and ends with communicative performance and revision. In this way, technology functions as a bridge between sound awareness and real language use. AI speech recognition and speech-to-text tools provide immediate evidence of pronunciation clarity; listening quizzes strengthen sound perception; and mobile video tasks allow students to apply target sounds in meaningful speaking contexts. For Thai Undergraduates at Rajabhat Universities, these activities are especially valuable because they connect pronunciation practice with academic, campus, professional, and local community communication.

X. New Knowledge

The key contribution of this academic article is the Technology-Enhanced Pronunciation Development Model for Thai undergraduates at Rajabhat Universities. The model suggests that Thai learners' English pronunciation difficulties should not be viewed as isolated sound errors. Rather, they are related to three main factors: differences between the Thai and English sound systems, limited ability to distinguish English sounds through listening, and insufficient pronunciation practice with meaningful feedback. When these issues are addressed through digital tools and communicative activities, learners can develop clearer pronunciation, better listening comprehension, greater speaking fluency, stronger confidence, improved intelligibility, and more effective communication.

The model indicates that Thai learners commonly face problems with unfamiliar English consonants, word-final consonants, consonant clusters, vowel contrasts, stress, rhythm, and intonation. These difficulties may

affect both their ability to recognize spoken English and their ability to produce clear oral messages. Therefore, pronunciation instruction should combine listening perception, controlled sound practice, speaking performance, feedback, and revision.

Technology plays a significant role in this instructional process. Tools such as AI speech recognition, mobile pronunciation applications, online dictionaries, speech-to-text programs, voice and video recording, and online listening quizzes can provide repeated practice, self-monitoring, immediate feedback, and opportunities for improvement. The model emphasizes that pronunciation instruction should progress from sound awareness to meaningful communicative use.

In practice, students first become aware of difficult English sounds, then practice listening discrimination, produce target sounds, record and revise their speech, and finally apply pronunciation in real communication tasks, such as local tourism presentations, campus direction role plays, job interviews, public service dialogues, and community product promotion videos. Thus, technology-enhanced pronunciation instruction serves as a bridge between pronunciation learning and meaningful communication in academic, professional, and local community contexts.

This model offers a practical framework for English pronunciation teaching in Thai higher education. It connects pronunciation difficulties with listening perception, digital feedback, repeated speaking practice, and communicative application. It is particularly suitable for Rajabhat University students because it links pronunciation development with academic communication, local tourism, public service, community product promotion, and future workplace communication. Figure 1 summarizes the relationship among pronunciation problems, their causes, and the role of technology in reducing these difficulties through listening practice, speaking practice, feedback, and communicative use.

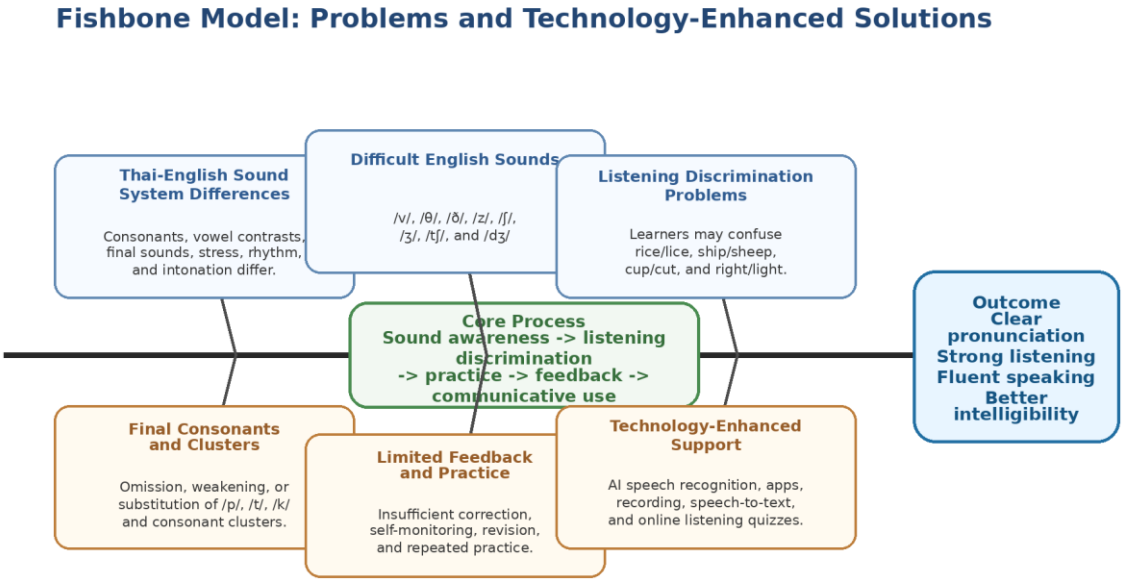

Figure 1: *The fishbone model illustrates the main pronunciation difficulties affecting speaking and listening skills among Thai Undergraduates and shows how technology-enhanced support can help reduce these difficulties.*

As shown in Figure 1, pronunciation difficulties among Thai learners are caused by several interconnected factors, including Thai-English sound system differences, difficult English sounds, final consonant problems, consonant clusters, limited listening discrimination, and insufficient feedback. The figure also shows

that technology-enhanced tools can serve as instructional support to help students notice, practice, correct, and apply pronunciation in meaningful communication.

Building on the problem analysis in Figure 1, Figure 2 presents the instructional process of the Technology-Enhanced Pronunciation Development Model. While Figure 1 explains the causes and support mechanisms, Figure 2 shows how learners move step by step from sound awareness to real communicative use.

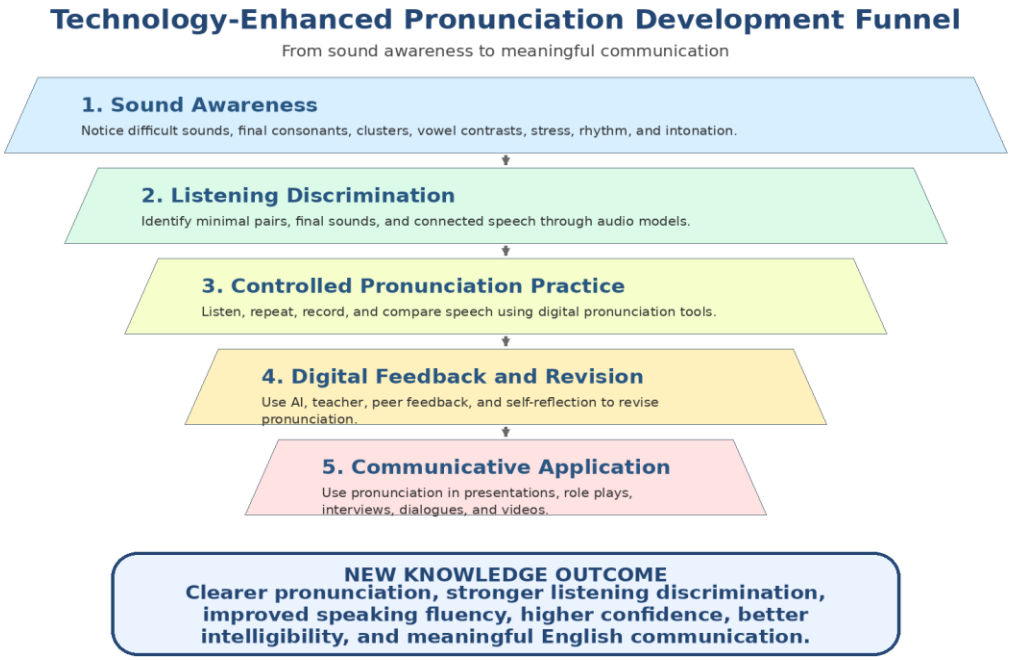

Figure 2: *The funnel model presents the process of technology-enhanced pronunciation development, beginning with sound awareness and ending with meaningful communication outcomes.*

Figure 2 illustrates that pronunciation development should begin with sound awareness and listening discrimination before moving to controlled pronunciation practice, digital feedback, revision, and communicative speaking and listening tasks. This sequence reflects the main contribution of the model: technology should not be used only for mechanical repetition, but should guide students toward clearer pronunciation, stronger listening ability, greater speaking confidence, and more meaningful English communication.

XI. CONCLUSION

Technology-enhanced pronunciation instruction of challenging English sounds offers a practical and contextually responsive approach for improving the speaking and listening skills of Undergraduates at Rajabhat Universities in Thailand. The reviewed concepts indicate that Thai learners' pronunciation difficulties are closely related to differences between Thai and English sound systems, particularly final consonants, consonant clusters, unfamiliar consonants, vowel contrasts, stress, rhythm, and intonation. These difficulties influence not only pronunciation accuracy but also listening discrimination, speaking fluency, confidence, intelligibility, and real communicative performance.

The integration of AI speech recognition, mobile pronunciation applications, online pronunciation models, voice and video recording, speech-to-text tools, listening quizzes, and digital feedback can create a more flexible and learner-centered pronunciation learning environment. Such technologies allow students to listen to models, repeat target sounds, record their voices, compare their pronunciation with accurate examples, receive

feedback, and revise their performance. This repeated cycle of listening, production, feedback, and revision supports both autonomous learning and classroom-based instruction.

In relation to speaking development, technology-enhanced pronunciation instruction helps students produce clearer and more intelligible speech in communicative tasks. Activities such as campus direction role plays, local tourism presentations, community product promotion videos, public service dialogues, and job interview simulations enable learners to apply sound practice to meaningful communication. These tasks also support fluency, vocabulary use, interaction, confidence, and content organization. When students can monitor and improve their pronunciation through digital tools, they are more likely to participate actively in oral communication.

In relation to listening development, pronunciation instruction supported by technology helps learners recognize sound differences more accurately. Minimal-pair listening, final sound recognition, sentence-level listening, and listening-and-responding tasks can strengthen students' ability to distinguish challenging English sounds in real speech. This is important because learners must be able to perceive sound contrasts before they can produce them effectively. Therefore, listening discrimination and pronunciation production should be taught together rather than separately.

For Rajabhat Universities, this approach is particularly valuable because it connects English learning with local community communication. Students can use English to describe local tourist attractions, explain cultural practices, promote local products, provide campus information, and communicate with visitors or stakeholders. Technology-enhanced pronunciation instruction therefore supports not only language learning but also local engagement, digital literacy, learner autonomy, and professional preparation. It provides a meaningful direction for English teaching in Thai higher education by integrating pronunciation, speaking, listening, technology, and authentic communication.

Table 7: *Connection between technology-enhanced pronunciation instruction and speaking-listening development*

Technology-enhanced element	Learning activity	Speaking/listening support	Expected outcome
AI speech recognition	Students read words or sentences and check speech-to-text output.	Links pronunciation production with listening awareness.	Improved sound accuracy and self-monitoring.
Mobile pronunciation applications	Students listen, repeat, and compare target sounds.	Supports controlled sound practice and repeated listening.	Better pronunciation accuracy and learner autonomy.
Voice/video recording	Students record role plays, presentations, or dialogues.	Connects pronunciation practice with speaking fluency.	Greater confidence, fluency, and intelligibility.
Online listening quizzes	Students complete minimal-pair and final-sound recognition tasks.	Strengthens sound perception before oral production.	Improved listening discrimination and comprehension.
Communicative digital tasks	Students create tourism, product, or campus service videos.	Applies pronunciation to real speaking and listening contexts.	More meaningful communication and local relevance.

Overall, technology-enhanced pronunciation instruction provides a coherent instructional model for addressing challenging English sounds among Thai Undergraduates. By combining sound awareness, listening discrimination, speaking practice, digital feedback, and community-based communication tasks, learners can

develop clearer pronunciation, stronger listening ability, improved speaking fluency, greater confidence, and more effective intelligibility in academic, professional, and local communication contexts.

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