

Teacher Preparedness for Teaching English Phonology in the Era of Artificial Intelligence: A Critical Literature Review

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ARTICLE INFORMATION	ABSTRACT
Article history: Published: October 2026	The rapid development of Artificial Intelligence (AI) is transforming English language teaching by introducing new possibilities for personalized instruction, automated feedback, speech recognition, and pronunciation practice. However, the pedagogical value of these technologies depends substantially on teachers' preparedness to select, evaluate, and integrate them appropriately into phonology instruction. This critical literature review examines the preparedness of English language teachers to teach English phonology in an era increasingly shaped by AI. Drawing on recent scholarship on AI in English language teaching, pronunciation instruction, teacher readiness, and professional development, the review critically synthesizes the opportunities, competencies, challenges, and pedagogical implications associated with AI-mediated phonology teaching. The literature indicates that AI-supported tools can facilitate pronunciation practice, provide individualized feedback, support speech perception and production, and enhance learner engagement. Nevertheless, effective integration requires teachers to possess not only technological competence but also strong knowledge of English phonology, pronunciation pedagogy, critical AI literacy, and the ability to evaluate the accuracy and pedagogical appropriateness of AI-generated feedback. The review further identifies persistent challenges, including inadequate professional development, varying levels of teacher confidence, technological and infrastructural constraints, concerns about data privacy and bias, and the risk of over-reliance on automated feedback. Evidence also suggests that targeted AI-related training is associated with greater teacher use and more positive perceptions of AI in pronunciation teaching. The review therefore argues that teacher preparedness should be understood as a multidimensional construct encompassing phonological knowledge, pedagogical expertise, technological competence, critical evaluation skills, and ethical awareness. It concludes that sustainable AI integration in English phonology teaching requires teacher-centred professional development that positions AI as a pedagogical support rather than a replacement for teachers' professional judgment. The review also highlights gaps in the existing literature and proposes directions for future research on teacher preparedness and AI-supported phonology instruction.
Keywords: Artificial Intelligence English Phonology Pronunciation Teaching Teacher Preparedness AI Literacy English Language Teaching Teacher Professional Development AI-Assisted Language Learning	

1. Introduction

1.1 Background to the Study

English pronunciation and phonology constitute an important dimension of successful English language learning because spoken communication requires learners not only to know what to say but also to produce and interpret speech in a way that can be understood by other speakers. Pronunciation includes the production of individual consonants and vowels as well as suprasegmental features such as stress, rhythm and intonation. In contemporary English language teaching, the objective of pronunciation instruction has increasingly shifted from the pursuit of a native-like accent towards intelligibility, that is, the extent to which a learner's speech can be understood by listeners. Wang and Wen (2023), for example, document a movement towards intelligibility as an important goal of English pronunciation teaching, particularly in response to the increasing use of English as a lingua franca. Thus, pronunciation instruction is not simply concerned with eliminating learners' accents; rather, it is concerned with helping learners communicate effectively and be understood in a variety of English-speaking contexts.

The importance of pronunciation is also reflected in research on English language teaching practices. Almusharraf (2024), in a study of 163 university EFL instructors, reports that most teachers recognized pronunciation as important to English language learning and communication. The study also connects pronunciation instruction with learners' intelligibility, confidence, motivation and broader communicative competence. However, the research identifies a significant discrepancy between teachers' recognition of the importance of pronunciation and the amount and nature of pronunciation instruction actually provided in EFL classrooms. This discrepancy is important because learners may have adequate knowledge of vocabulary and grammar but still experience communication difficulties if their pronunciation makes their speech difficult to understand.

Pronunciation and phonology instruction therefore place an important responsibility on English language teachers. Teachers need to help learners develop awareness of English sound systems, identify pronunciation difficulties, practise problematic sounds, and understand suprasegmental features such as word stress, sentence stress and intonation. Effective pronunciation teaching also

requires teachers to select appropriate activities, provide meaningful opportunities for oral practice and offer corrective feedback. In this regard, teachers' own phonological knowledge and pedagogical preparation are important because the effectiveness of pronunciation instruction depends partly on their ability to identify learners' difficulties and determine appropriate instructional responses. Almusharraf (2024) found that although many university EFL instructors expressed confidence in their own English pronunciation, a considerable proportion reported insufficient training to provide comprehensive pronunciation instruction and assessment. The difficulties experienced by teachers are further highlighted by research specifically examining pronunciation instruction. Tiwari (2024), investigating secondary-level English teachers' perspectives, identifies pronunciation teaching as an area associated with a number of practical and pedagogical challenges. Similarly, a systematic review of research on non-native English-speaking teachers reports that inadequate teacher training, limited instructional time and insufficient teaching materials can constrain pronunciation instruction. The review also found that teachers may recognize the importance of pronunciation while continuing to rely on traditional activities such as drills because of contextual and professional constraints. These findings suggest that improving pronunciation instruction requires attention not only to learners' needs but also to teachers' professional knowledge, resources, confidence and working conditions.

Another important development in language education is the rapid emergence of Artificial Intelligence (AI). AI has increasingly become integrated into educational technologies capable of processing language, recognizing speech, generating language and providing personalized learning support. The development of generative AI systems has accelerated this transformation. A systematic review by Li et al. (2025), which examined 144 peer-reviewed empirical studies published during the first two years of generative AI research in language learning and teaching, reports rapid growth in empirical research and a movement from exploratory discussions towards more systematic investigation of AI-supported language education. A separate systematic review of 49 empirical studies published between 2023 and 2024 similarly identifies instructional support, learner interaction and feedback among the major areas of generative AI research in language education.

The emergence of AI is particularly relevant to pronunciation and phonology because several AI technologies can process spoken language. One important application is Automatic Speech Recognition (ASR). ASR technology converts spoken language into machine-readable representations and can therefore be incorporated into language-learning systems that analyse learners' speech. In pronunciation learning, this creates opportunities for learners to receive immediate feedback while practising speaking. A major 2024 review synthesized evidence from 50 studies investigating ASR in computer-assisted language learning and specifically examined claims concerning the assessment and improvement of second-language pronunciation. The review indicates that ASR research has developed substantially, although the evidence varies across studies and the effectiveness of individual systems cannot automatically be generalized to all language-learning contexts.

AI-supported pronunciation systems can consequently provide automated pronunciation feedback. Instead of depending exclusively on a teacher to listen to every learner's pronunciation, an AI-supported application can analyse speech and provide learners with information about their production. Computer-assisted pronunciation training (CAPT) has been investigated as a means of combining technology with pronunciation instruction and assessment. Amrate and Tsai (2024), in a systematic review of 30 empirical studies of computer-assisted pronunciation training, demonstrate the growing body of research examining technology-supported approaches to second-language pronunciation. Such technologies may be particularly useful when learners require repeated practice because they can create additional opportunities for individual practice beyond the limited amount of speaking time available during classroom lessons.

AI can also support pronunciation learning through intelligent and personalized language-learning systems. Peña-Acuña and Corga Fernandes Durão (2024), in a systematic review focusing on AI-supported English learning, identify applications including pronunciation-improvement tools, chatbots and adaptive platforms that modify learning content according to learners' progress. Their findings indicate that AI can contribute to personalized learning and pronunciation development, although they also emphasize the need for further evidence concerning effectiveness and equitable access. This is relevant to pronunciation instruction because learners differ considerably in their linguistic backgrounds, pronunciation difficulties and learning needs; adaptive systems may therefore provide forms of individualized practice that are difficult to achieve through whole-class instruction alone.

A further AI application relevant to phonology is conversational AI. Generative AI systems can engage learners in simulated conversations and provide opportunities for oral interaction. Such systems may be used to create speaking tasks, model language, generate practice activities and support learner reflection. Research on generative AI in language education increasingly identifies conversational interaction as one of the important functions of these technologies. The systematic review by Prince, Almusharraf and Shehzad (2026), for instance, identifies evaluative feedback, adaptive scaffolding, generative language support and conversational assistance among the major functions of AI in school language education.

However, the availability of AI tools does not necessarily mean that they can be effectively integrated into pronunciation and phonology teaching. One major concern is the accuracy and reliability of automated speech analysis. ASR systems may perform differently depending on speakers' accents, pronunciation patterns, speech styles and other characteristics. The evidence synthesized by the 2024 ASR review demonstrates that research findings vary considerably across systems and contexts, meaning that teachers need to interpret AI-generated assessments rather than automatically treating them as equivalent to expert human judgments. This consideration is especially important in English pronunciation because English is characterized by considerable variation across geographical, social and international contexts. A system designed around a narrow pronunciation model may not adequately represent the range of legitimate English varieties encountered by learners.

Consequently, the increasing availability of AI technologies creates a new dimension of responsibility for English language teachers. Teachers are no longer required only to possess linguistic and pedagogical knowledge; they increasingly need to understand how AI-supported technologies operate and how those technologies can be incorporated appropriately into teaching. UNESCO's AI Competency Framework for Teachers (Miao & Cukurova, 2024) identifies 15 teacher competencies across five dimensions: human-

centred mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional learning. The framework emphasizes that teachers require technical, ethical and pedagogical competencies to exercise informed professional judgment when using AI. Teacher preparedness is therefore an important issue in the integration of AI into English language teaching. Research involving language teachers indicates that positive attitudes towards AI do not necessarily correspond to sufficient practical competence. For example, a 2024 study of beginning and first-year language teachers found differences in readiness: first-year teachers were generally more prepared to use generative AI, partly because of their previous experience with ChatGPT, whereas beginning teachers reported limited knowledge of such technologies. The researchers consequently emphasize the implications for initial teacher education and continuing professional development.

Recent systematic research on AI integration in English language teaching similarly suggests that teacher readiness is multidimensional. A 2026 systematic review of 20 studies published between 2021 and 2025 reports that AI can support lesson adaptation, task preparation, teacher creativity and classroom efficiency, but also identifies professional-development needs and other factors affecting teachers' readiness to integrate AI. Another recent review focusing specifically on AI literacy and EFL teachers' readiness identifies barriers including inadequate infrastructure, insufficient professional-development opportunities, ethical concerns and AI-related anxiety. These findings indicate that simply providing teachers with access to AI applications may not be sufficient; teachers also need appropriate professional preparation.

The issue of teacher readiness becomes even more significant when AI is applied specifically to pronunciation and phonology. Teachers need sufficient phonological knowledge to determine whether an AI-generated pronunciation assessment is appropriate, sufficient technological knowledge to operate AI-supported applications, and sufficient pedagogical knowledge to integrate those applications into meaningful classroom activities. In other words, effective AI-supported pronunciation instruction requires an intersection of subject-matter knowledge, pedagogical knowledge and technological knowledge. Without these competencies, teachers may use AI merely as an additional technological tool rather than integrating it strategically into pronunciation teaching.

The need to examine teacher preparedness is therefore supported by both pronunciation research and the emerging literature on AI in language education. On the pronunciation side, research indicates a persistent gap between the recognized importance of pronunciation and actual classroom practice, with inadequate training and limited resources among the factors affecting instruction. On the AI side, research indicates substantial potential for personalized learning, automated feedback, speech recognition and conversational interaction, while simultaneously identifying challenges involving accuracy, ethics, infrastructure and teacher competence. It is therefore necessary to investigate whether English language teachers are adequately prepared to integrate AI technologies into pronunciation and phonology instruction. Such preparedness should be examined in terms of teachers' knowledge of English phonology, familiarity with AI-supported pronunciation technologies, technological competence, confidence in using AI, ability to evaluate automated feedback, perceived benefits and challenges, and professional-development needs. Examining these dimensions can help determine not simply whether AI tools are available, but whether teachers possess the competencies required to use them responsibly and pedagogically effectively. This is consistent with UNESCO's position that successful AI integration requires teachers to develop competencies in AI applications, AI pedagogy, ethics and continuing professional learning.

Therefore, the present study is situated at the intersection of English pronunciation and phonology, teacher professional competence, and artificial intelligence in language education. While existing studies have examined pronunciation instruction, computer-assisted pronunciation training and AI-supported language learning separately, there remains a need to understand more specifically how prepared English language teachers are to integrate AI technologies into pronunciation and phonology instruction. Investigating this issue can provide evidence for teacher education, professional-development programmes and institutional policies aimed at ensuring that emerging AI technologies are used as pedagogically meaningful tools for improving English pronunciation learning.

1.2 Statement of the Problem

Although artificial intelligence (AI) is increasingly being integrated into language teaching and pronunciation practice, the preparedness of English teachers to use AI effectively in teaching phonology remains a significant concern. While existing literature has extensively examined the use of AI tools in language learning, comparatively less attention has been given to teachers' readiness to integrate these technologies into phonology instruction. In particular, there is a need to examine teachers' knowledge of AI-supported phonology teaching, technological competence, pedagogical readiness, confidence, and familiarity with appropriate AI applications for developing learners' pronunciation and phonological awareness.

Furthermore, the effective integration of AI into phonology instruction may be affected by several challenges, including inadequate training, limited technological skills, uncertainty about appropriate pedagogical applications, access to suitable AI tools, and concerns regarding the accuracy and reliability of AI-generated pronunciation feedback. These gaps may limit teachers' ability to exploit the potential of AI for effective phonology instruction. Therefore, the central problem addressed by this study is the insufficient understanding of English teachers' preparedness, competencies, confidence, and challenges in using AI to support the teaching of phonology. Investigating these aspects is important for identifying teachers' professional development needs and determining the conditions necessary for meaningful and effective AI-supported phonology instruction.

1.3 Purpose of the Study

The purpose of this study is to critically examine the existing literature on teachers' preparedness to teach English phonology in the era of artificial intelligence (AI). Specifically, the study seeks to identify the opportunities and challenges associated with the integration of AI into phonology instruction, as well as the competencies teachers require to use AI-supported tools effectively. It also aims to examine teachers' professional-development needs in relation to AI-enhanced phonology teaching and to highlight gaps in the existing literature that warrant further investigation.

1.4 Objectives of the Study

The study aims to:

- Examine teachers' preparedness for teaching English phonology.
- Explore the use of AI in supporting English phonology and pronunciation instruction.
- Identify the competencies, readiness factors, and challenges related to AI-supported phonology teaching.

1.5 Research Questions

- What does existing literature reveal about teachers' preparedness for teaching English phonology?
- How is AI being used to support English phonology and pronunciation instruction?
- What competencies, factors, and challenges influence teachers' readiness to use AI in phonology teaching?

2. Literature Review

2.1 Introduction

English phonology is concerned with the organization and patterning of sounds in the English language. In the context of second-language learning, pronunciation involves more than the accurate production of individual consonants and vowels; it also includes broader features of spoken language that contribute to intelligibility and comprehensibility (Celce-Murcia et al., 2010; Derwing & Munro, 2015). Research on L2 pronunciation has increasingly emphasized intelligibility and comprehensibility rather than the attainment of a native-like accent as the central objectives of pronunciation instruction (Derwing & Munro, 2015; Munro & Derwing, 2011).

2.2 Conceptualizing English Phonology

English phonology can be examined through both segmental and suprasegmental dimensions. Segmental phonology focuses on individual consonants and vowels, whereas suprasegmental phonology encompasses features such as stress, rhythm, and intonation that operate across individual segments. Celce-Murcia et al. (2010) emphasize the importance of integrating both dimensions in pronunciation instruction, while Derwing and Munro (2015) argue for an approach to pronunciation that considers its contribution to successful communication.

2.2.1 Segmental phonology

Segmental phonology concerns the individual sound units that make up spoken English, particularly consonants and vowels. Differences between the sound system of English and that of a learner's first language may create challenges in the perception and production of particular sounds. Consequently, knowledge of segmental contrasts is an important component of pronunciation development (Celce-Murcia et al., 2010; Derwing & Munro, 2015).

2.2.2 Consonants and vowels

Consonants can be described according to their place and manner of articulation as well as their voicing characteristics, while vowels are distinguished by properties such as tongue position and height and lip configuration. These distinctions are central to understanding the English sound system and provide a basis for analysing pronunciation difficulties among second-language learners (Celce-Murcia et al., 2010).

However, accurate production of individual sounds should not be regarded as the only objective of pronunciation learning. Research on L2 pronunciation has demonstrated the importance of intelligibility and comprehensibility in evaluating spoken performance (Derwing & Munro, 2015; Munro & Derwing, 2011).

2.2.3 Suprasegmental features

Suprasegmental features operate over stretches of speech rather than being restricted to individual consonants or vowels. They include stress, rhythm and intonation and are closely associated with the organization and interpretation of spoken language. Celce-Murcia et al. (2010) treat suprasegmental as an important component of pronunciation teaching, while Derwing and Munro (2015) situate pronunciation within a broader framework of comprehensibility and intelligibility.

2.2.4 Stress

Stress refers to the relative prominence assigned to a syllable or word in speech. In English, stress contributes to the organization of words and utterances and interacts with other prosodic features. Both word stress and sentence-level prominence are therefore relevant to the production and perception of spoken English (Celce-Murcia et al., 2010).

For second-language learners, difficulties with pronunciation can involve not only individual segments but also prosodic patterns. This supports a broader approach to pronunciation instruction in which suprasegmental features are considered alongside segmental accuracy (Derwing & Munro, 2015).

2.2.5 Rhythm

Rhythm concerns the temporal organization of speech and the relationship between stressed and unstressed syllables. English has traditionally been described as stress-timed, but a rigid distinction between stress-timed and syllable-timed languages has been questioned in linguistic research. Consequently, English rhythm can be discussed in terms of the interaction of stress, duration, prominence and vowel reduction rather than as a simple categorical property.

2.2.6 Intonation

Intonation concerns patterns of pitch movement across spoken utterances. It contributes to the interpretation of meaning, the organization of discourse and the expression of communicative intentions. In pronunciation teaching, intonation therefore needs to be considered alongside segmental accuracy and other prosodic features (Celce-Murcia et al., 2010).

2.2.7 Connected speech

Connected speech describes the ways in which words and sounds are produced when they occur in continuous speech rather than in isolation. Processes such as assimilation, elision, linking, reduction and the use of weak forms contribute to the characteristic patterns of naturally occurring spoken English. These processes are important for both pronunciation and listening because learners may encounter forms in continuous speech that differ considerably from the citation forms they have learned individually (Celce-Murcia et al., 2010).

From an L2 perspective, connected-speech processes are therefore relevant to both production and comprehension. A pronunciation framework that focuses exclusively on isolated sounds may not fully account for the difficulties learners experience in natural spoken communication (Derwing & Munro, 2015).

2.3 Teaching and Learning English Phonology:

Review Traditional approaches to phonology teaching Traditional pronunciation teaching was strongly influenced by behaviourist and audio-lingual principles, emphasizing imitation, repetition, memorization, discrimination drills, minimal pairs, and accurate production of individual sounds. Learners were often expected to listen to a model and reproduce it until the desired form became habitual. Such techniques can be useful for developing awareness and controlled production of difficult sounds, but their limitation is that they may separate pronunciation from meaningful communication. Research on pronunciation materials has shown that even when materials moved toward communicative content, many activities continued to rely heavily on drills and imitation (Celce-Murcia et al., 1996). A further limitation of traditional approaches is their tendency to treat pronunciation mainly as a matter of segmental accuracy—that is, mastering consonants and vowels. However, successful spoken communication also depends on suprasegmental features such as stress, rhythm, intonation, linking and reductions. Celce-Murcia et al. (1996) therefore argue for a broader understanding of pronunciation that incorporates connected speech and discourse rather than isolated sounds alone.

Communicative approaches. The development of Communicative Language Teaching (CLT) changed the purpose of pronunciation instruction. Instead of making native-like pronunciation the central objective, communicative approaches increasingly emphasize intelligibility and comprehensibility, allowing learners to communicate successfully even when their speech retains features of their first language. This represents an important shift because accent is not necessarily equivalent to poor communication. Derwing and Munro (2008) argue that the persistence of an L2 accent should be distinguished from difficulties that actually interfere with understanding.

Nevertheless, communicative approaches should not mean that pronunciation is simply left to develop naturally. A purely fluency-oriented classroom may give learners opportunities to speak without providing sufficient attention to problematic phonological features. Recent research supports integrating explicit pronunciation instruction with communicative activities, particularly where learners receive feedback and practise pronunciation in meaningful contexts.

Pronunciation-focused instruction Pronunciation-focused instruction gives systematic attention to both segmental and suprasegmental features. Segmental instruction may address problematic vowels, consonants and consonant clusters, while suprasegmental instruction includes word stress, sentence stress, rhythm, intonation, linking and other features of connected speech. Celce-Murcia et al. (1996) emphasize that these elements collectively contribute to learners' ability to communicate effectively.

Critically, the objective should not necessarily be the elimination of a learner's accent. Research increasingly supports intelligibility and comprehensibility as more realistic instructional goals than native-like pronunciation. Explicit instruction can improve comprehensibility, but pronunciation teaching is most productive when learners understand why a feature matters and have opportunities to use it in meaningful speech rather than practising isolated forms indefinitely (Derwing & Munro, 2005; Thomson & Derwing, 2015).

Difficulties in teaching and learning phonology Learning English phonology can be difficult because English sound patterns may differ substantially from those of learners' first languages (L1s). Learners may consequently have difficulty perceiving or producing unfamiliar sounds, consonant clusters, stress patterns or intonation. L1 influence is therefore an important factor in explaining persistent pronunciation difficulties, although it is not the only one; age, exposure, individual differences, perception, motivation and opportunities for practice can also influence development.

Another difficulty is that English pronunciation involves considerable variation in connected speech. Learners who can accurately pronounce individual words may still struggle to understand or produce natural speech because of linking, reduction, rhythm and changing stress patterns. Furthermore, teachers themselves may have limited preparation in pronunciation pedagogy. Derwing and Munro (2005) note that pronunciation has historically been marginalized in applied linguistics, leaving some teachers dependent on personal intuition rather than research-based guidance.

The teacher's role in phonology instruction: The teacher has an important role as facilitator, model, diagnostician and provider of feedback. Rather than simply asking learners to imitate a model, the teacher should identify pronunciation features that are relevant to intelligibility, provide appropriate explanations and demonstrations, and create opportunities for controlled practice followed by communicative use. Morley (1991) similarly presents pronunciation teaching as a multidimensional process involving instructional objectives, learner roles, teacher roles and different modes of practice.

The teacher should also avoid equating successful pronunciation with sounding exactly like a native speaker. A more inclusive role involves helping learners become understandable, confident and effective communicators, while respecting legitimate varieties of English. This requires informed selection of pronunciation priorities, appropriate corrective feedback and regular integration of pronunciation into speaking and listening activities. Research also calls for stronger collaboration between pronunciation researchers and classroom teachers so that instructional decisions are supported by empirical evidence (Derwing & Munro, 2005).

2.4 Teacher Preparedness and Teacher Competence

Teacher preparedness for technology-enhanced instruction cannot be reduced to the ability to operate digital tools. It involves a combination of subject-matter knowledge, pedagogical knowledge, technological knowledge, and the capacity to combine these

forms of knowledge appropriately. Shulman's (1986) concept of pedagogical content knowledge established that effective teaching requires more than knowing a subject; teachers must also know how to transform disciplinary knowledge into forms that learners can understand. This is particularly important in English phonology, where teachers need both accurate knowledge of phonological systems and appropriate strategies for explaining sounds, stress, rhythm, intonation, and connected speech.

Technological knowledge refers to teachers' understanding of digital tools and their practical use, whereas pedagogical knowledge concerns instructional strategies, assessment, classroom management, and learner engagement. However, possessing these forms of knowledge independently does not guarantee effective technology integration. Mishra and Koehler's (2006) TPACK framework argues that effective technology integration depends on the interaction between content, pedagogy, and technology rather than on technology knowledge alone. Thus, an English teacher may be technologically competent but still struggle to use an AI pronunciation application effectively if they lack phonological or pedagogical knowledge.

Digital literacy is therefore broader than technical proficiency. Teachers must be able to locate, evaluate, interpret, create, and use digital information critically. In AI-supported education, this includes understanding the limitations of automated outputs and making informed judgements about whether AI-generated explanations or pronunciation assessments are pedagogically appropriate. UNESCO's (2024) AI Competency Framework similarly conceptualizes teacher competence in terms of human-centred thinking, AI ethics, AI foundations, AI pedagogy, and AI-supported professional learning.

Teacher confidence and self-efficacy are also important because teachers who doubt their ability to use technology may be less willing to experiment with AI-supported instruction. Recent research indicates that technological self-efficacy is associated with teachers' attitudes and intentions toward AI adoption. However, confidence should not be interpreted as competence: teachers may feel confident using AI while lacking the expertise required to evaluate its linguistic or pedagogical accuracy.

Professional development is therefore essential. Effective AI training should move beyond demonstrations of individual tools and develop teachers' ability to evaluate, adapt, and pedagogically integrate AI. Celik (2023) found that technological knowledge alone was insufficient for effective AI integration; technological and pedagogical knowledge needed to work together. This suggests that professional development for English teachers should combine AI literacy with language pedagogy and phonological expertise.

2.5 Artificial Intelligence in Language Education

Artificial intelligence in education refers broadly to computational systems capable of performing functions associated with human intelligence, including language processing, prediction, classification, generation, and adaptive decision-making. In language education, AI has developed from relatively rule-based computer-assisted language-learning systems toward speech recognition, intelligent tutoring systems, conversational agents, automated assessment, and generative AI. A recent systematic review of 161 studies demonstrates the increasing diversity of AI applications in language education, including conversational systems, speech-recognition technologies, and automated feedback tools.

Generative AI represents a significant development because systems based on large language models can generate explanations, exercises, dialogues, examples, and other instructional materials. Unlike earlier technologies that mainly responded to predefined inputs, generative systems can produce novel content. Nevertheless, their ability to generate fluent language does not guarantee linguistic or pedagogical accuracy. Consequently, teachers remain important as evaluators and mediators of AI-generated material rather than simply users of automatically produced content.

Speech-recognition technologies are particularly relevant to pronunciation teaching because they can convert learners' spoken language into digital representations and provide information about their production. Research has found that ASR-supported instruction can contribute to pronunciation development, particularly when learners receive opportunities for repeated practice and feedback. However, the literature also indicates that much ASR research concentrates on segmental accuracy, leaving suprasegmental features such as rhythm, intonation, and connected speech comparatively less developed.

Intelligent tutoring systems provide adaptive instruction by responding to learners' performance and adjusting learning activities. Conversational AI extends this principle through interactive dialogue, potentially creating additional opportunities for learners to practise speaking without waiting for teacher availability. Recent reviews suggest that conversational and generative AI have been particularly associated with increased speaking practice, fluency, confidence, and learner autonomy, whereas speech-recognition systems have shown stronger connections with pronunciation development.

Automated feedback systems can provide immediate information about learner performance, while AI-powered language-learning platforms combine several technologies, including speech recognition, adaptive exercises, automated assessment, and conversational interaction. Their major pedagogical advantage is therefore not simply automation but the possibility of providing repeated, individualized practice. Nevertheless, effectiveness depends on the quality of feedback and the teacher's ability to interpret and contextualize it.

2.6 AI in English Pronunciation and Phonology Teaching

Automated pronunciation assessment has become one of the most established applications of AI in language learning. ASR-based systems can analyse learners' speech and identify discrepancies between learner production and target pronunciation. A systematic review of 24 empirical studies found that most research has focused on pronunciation accuracy, particularly segmental features, suggesting that automated systems have considerable potential but that the evidence base remains narrower than the full scope of phonology teaching.

Research provides evidence that ASR can support pronunciation improvement. For example, Wang and Young (2015) found that formative feedback in an ASR-based CALL system supported articulation development, while summative feedback encouraged learners to reflect on their progress. Importantly, their findings also suggested that learners differed in the types of feedback they preferred, indicating that feedback design should take learner characteristics into account.

More recent research strengthens this evidence. Cucchiarini and colleagues' study involving 117 Indonesian secondary-school learners found significant pronunciation improvements following practice with two ASR-based systems. The system providing more

detailed phonetic feedback produced greater progress than the system offering more global corrective feedback. This finding suggests that the pedagogical value of AI may depend not simply on whether feedback is automated but, on the specificity, and linguistic quality of that feedback.

AI-generated pronunciation feedback can also encourage learner autonomy because students can practise repeatedly without requiring constant teacher intervention. Takenouchi (2022), for example, reported improvements following explicit pronunciation instruction combined with ASR practice among Japanese adult EFL learners. The study also suggested that checking ASR transcriptions increased learners' awareness of their pronunciation.

Conversational AI creates another possibility by allowing learners to engage in spoken interaction. However, conversational ability should not be confused with phonological expertise. A chatbot may maintain a conversation successfully without providing accurate information about phoneme production, stress, rhythm, or intonation. Consequently, conversational AI is potentially useful for communicative practice, but specialized pronunciation assessment may still require speech-analysis technologies and teacher mediation.

Individualized pronunciation practice is one of the strongest potential benefits of AI. Learners can repeat difficult words or sounds, receive immediate responses, and practise at their own pace. Recent systematic reviews report positive effects of AI pronunciation tools on pronunciation accuracy, confidence, and engagement. However, much of the existing research uses relatively short interventions, making it difficult to determine whether observed improvements are sustained over longer periods.

AI-supported phonological awareness is less extensively researched than pronunciation accuracy. Nevertheless, ASR feedback may encourage learners to notice discrepancies between their intended production and the system's transcription. This can support metalinguistic awareness, but teachers remain necessary for explaining why a particular sound, contrast, stress pattern, or phonological process occurs. Thus, AI appears more strongly established as a practice and feedback mechanism than as an independent replacement for explicit phonological instruction.

2.7 Teacher Preparedness for AI Integration

Teacher preparedness for AI integration involves several interconnected dimensions. Digital competence provides the basic ability to operate technology, while AI literacy requires additional understanding of how AI systems work, what their limitations are, and how their outputs should be evaluated. UNESCO (2024) emphasizes that AI-ready teachers require competencies in AI foundations, ethics, pedagogy, human agency, and professional learning.

Pedagogical readiness is equally important because knowing how to operate an AI system does not establish how it should be used instructionally. Celik (2023) argues that technological knowledge becomes more meaningful when combined with pedagogical knowledge. This is particularly significant in phonology teaching because AI-generated feedback must be connected to explicit learning objectives and appropriate pronunciation pedagogy.

Technological confidence also affects teachers' willingness to experiment with AI. Research using the Technology Acceptance Model suggests that perceived usefulness and perceived ease of use are important factors in technology adoption. A meta-analysis of teachers' technology adoption found that TAM provides substantial explanatory value for teachers' behavioural intentions and technology use.

Access to appropriate technology remains a structural issue. AI integration requires reliable devices, internet connectivity, suitable software, technical support, and adequate time for teachers to learn new systems. Consequently, teacher preparedness should not be conceptualized solely as an individual characteristic. Institutional conditions can either enable or constrain teachers' ability to develop AI competence.

Teacher training should therefore combine technical demonstrations with pedagogical application, critical evaluation, ethics, and opportunities for sustained experimentation. UNESCO's framework explicitly positions AI-related professional learning as a continuing process rather than a one-off training event.

2.8 Opportunities of AI for Phonology Teaching

One major opportunity is personalized learning. AI systems can potentially provide learners with individualized pronunciation activities based on their performance rather than requiring all learners to complete identical exercises. This is particularly useful in phonology classes where learners may have different first-language backgrounds and consequently experience different pronunciation difficulties.

Immediate feedback is another important advantage. Traditional classroom instruction may limit the amount of individual pronunciation feedback that a teacher can provide, whereas ASR systems can respond immediately after a learner produces an utterance. Studies of ASR-based pronunciation instruction indicate that immediate feedback can support pronunciation improvement and learner awareness.

AI also increases opportunities for practice. Learners can repeat target sounds, words, and sentences outside normal classroom hours. This may be particularly valuable where teachers have large classes or limited instructional time. Recent reviews identify increased opportunities for autonomous speaking practice as one of the recurring benefits of AI-supported language learning.

AI can also provide individual learner support and assist teachers with pronunciation assessment. Rather than replacing teachers, such systems may reduce some repetitive assessment tasks and provide preliminary information that teachers can review. This creates the possibility of reallocating teacher time toward explanation, interaction, diagnosis, and individualized support.

Accessibility is another potential benefit. AI applications can allow learners to practise independently and repeatedly, although this benefit is dependent on access to suitable devices, connectivity, and affordable services. Consequently, the accessibility potential of AI should be considered alongside the risk of creating new forms of digital inequality.

2.9 Challenges and Risks

Insufficient teacher training remains a major challenge. Teachers may have access to AI tools without possessing the knowledge required to evaluate their outputs or integrate them meaningfully into instruction. UNESCO notes that many educational systems have historically lacked comprehensive national AI competency frameworks and teacher-development programmes.

Limited technological competence can therefore result in superficial adoption. A teacher may use AI simply because it is available rather than because it addresses a clearly identified learning problem. This reinforces the argument that successful AI integration requires pedagogical reasoning rather than technical familiarity alone.

The accuracy of AI pronunciation feedback is another concern. ASR systems can perform differently depending on accent, speech rate, background noise, and linguistic characteristics. Recent reviews identify difficulties in processing non-native accents and spontaneous speech. If learners receive inaccurate feedback, they may practise an incorrect target or misunderstand the nature of their pronunciation problem.

Dependence on technology also presents a pedagogical risk. Excessive reliance on automated assessment may reduce opportunities for teacher observation, peer interaction, and learner reflection. AI should therefore supplement rather than eliminate human judgement, particularly because pronunciation involves communicative intelligibility and variation rather than a single universally correct accent.

Digital inequality is another concern. Learners and teachers with limited access to reliable internet, appropriate devices, or paid AI services may benefit less from AI-supported instruction. Therefore, the introduction of AI does not automatically produce greater educational equality.

Privacy and ethical concerns are particularly relevant to speech technologies because learners' voices constitute personal data. AI systems may also involve the collection and processing of learner recordings. Teachers and institutions therefore need clear policies concerning data protection, consent, storage, and responsible use. UNESCO places ethics, human agency, accountability, and responsible AI use at the centre of teacher AI competence.

Cultural and linguistic bias is another significant concern. AI systems are trained on particular datasets and may perform less effectively with certain accents or linguistic varieties. Kohnke and Zou (2025) consequently argue that AI integration in TESOL needs to address bias, equity, cultural representation, and pedagogical integrity rather than treating AI as a neutral technology.

Finally, AI systems may have difficulty interpreting legitimate phonological variation. English has numerous accepted varieties, and pronunciation differences do not necessarily represent errors. A system that treats one variety as the only correct model may unintentionally reinforce accent-based hierarchies. This makes teacher mediation essential when interpreting automated pronunciation scores.

2.10 Theoretical Framework

TPACK TPACK provides a strong theoretical foundation for examining teacher preparedness because it conceptualizes effective technology integration as an interaction among technological knowledge, pedagogical knowledge, and content knowledge. Mishra and Koehler (2006) argue that technology integration is complex and situated, requiring teachers to understand how particular technologies interact with particular pedagogical approaches and subject matter.

For the present topic, TPACK can be applied to examine whether English teachers possess sufficient phonological/content knowledge, pedagogical knowledge, and technological knowledge to integrate AI into phonology instruction. Its limitation is that conventional TPACK does not explicitly address some AI-specific issues, such as algorithmic bias, AI-generated content, data ethics, and the need to evaluate AI decisions. Celik's (2023) Intelligent-TPACK model addresses this limitation by incorporating AI-specific and ethical dimensions.

Technology Acceptance Model (TAM) TAM can complement TPACK by explaining why teachers may accept or reject AI technologies. Davis (1989) identifies perceived usefulness and perceived ease of use as central determinants of technology acceptance. More recent research applying extended TAM models to teachers similarly considers self-efficacy and other contextual factors.

The two frameworks therefore address different aspects of the problem. TPACK explains what knowledge teachers need for meaningful integration, whereas TAM helps explain how teachers' perceptions influence their willingness to adopt technology. Combining them can therefore provide a more comprehensive conceptualization of teacher preparedness for AI-supported phonology teaching.

2.11 Empirical Review

The empirical literature can be organized around several interconnected themes rather than presented as isolated studies. The first theme is teacher preparedness, where research increasingly emphasizes technological competence, pedagogical knowledge, AI literacy, self-efficacy, and ethical awareness. Recent AI-TPACK studies suggest that AI integration requires knowledge extending beyond basic technological skills.

The second theme is AI integration in language education. Evidence shows that AI is being used through speech-recognition systems, conversational agents, intelligent tutoring systems, automated assessment, and generative AI. However, the literature is uneven: speech-recognition research has a relatively established pronunciation focus, while research on generative AI in language education is newer and still developing.

The third theme is AI-supported pronunciation and phonology instruction. Empirical studies generally report positive effects from ASR-supported practice, particularly in pronunciation accuracy and learner awareness. However, systematic reviews show that studies have disproportionately concentrated on segmental accuracy, while suprasegmental and broader phonological competence receive less attention.

The fourth theme concerns professional development and institutional support. Recent literature increasingly treats teacher training as a central component of AI implementation rather than an optional addition. UNESCO's framework and emerging AI-TPACK research both emphasize the need for structured, continuous professional learning.

The fifth theme is challenges and limitations. Research repeatedly identifies technological limitations, bias, unequal access, privacy concerns, inadequate training, and difficulties processing non-native speech. These findings suggest that AI effectiveness depends on the interaction between the technology, teacher competence, learner characteristics, and institutional context rather than on the technology alone.

2.12 Critical Synthesis of the Literature

The literature demonstrates considerable agreement that AI can create additional opportunities for language practice and feedback. ASR-based studies particularly provide evidence of pronunciation improvement, while conversational and generative AI appear to offer broader opportunities for speaking practice, fluency, confidence, and learner autonomy.

Nevertheless, the evidence should not be interpreted as demonstrating that AI automatically improves language learning. Many pronunciation studies employ small samples, relatively short interventions, or quasi-experimental designs. A recent systematic review of ASR research found that most studies concentrated on pronunciation accuracy and classroom-based activities, indicating that the evidence base remains narrower than the range of possible AI applications.

Methodologically, the literature also varies substantially. Experimental studies provide evidence about learner outcomes, while surveys provide information about teacher attitudes, confidence, and intentions. Qualitative studies can reveal teachers' experiences and pedagogical reasoning, but they may not establish measurable effects on learning. This methodological diversity is valuable, although it makes direct comparison across studies difficult.

There is also a theoretical imbalance. Pronunciation studies frequently focus on technological effectiveness, whereas teacher-preparedness studies increasingly use TPACK, AI-TPACK, or TAM. Consequently, relatively little research brings these perspectives together to explain how English teachers' phonological knowledge, pedagogical knowledge, AI literacy, confidence, and institutional conditions jointly influence AI-supported phonology teaching.

The literature therefore supports a shift from asking whether AI works to asking under what conditions, for which learners, for which phonological features, and with what level of teacher mediation AI is pedagogically effective. This represents an important direction for future research.

2.13 Research Gap

Although substantial research has examined AI-assisted language learning, pronunciation applications, speech-recognition systems, and generative AI, comparatively less attention has been devoted to the preparedness of teachers to integrate AI specifically into English phonology teaching. Existing pronunciation research tends to focus on learner outcomes and technological effectiveness, while teacher-focused AI research often examines general education rather than the specialized requirements of phonology.

A further gap concerns the relationship among phonological knowledge, pedagogical knowledge, technological competence, AI literacy, self-efficacy, and institutional support. Existing TPACK and AI-TPACK studies demonstrate the importance of integrated teacher knowledge, but this literature has not sufficiently examined how these dimensions operate in English pronunciation and phonology contexts.

There is also a contextual and methodological gap. Much pronunciation research has been conducted with particular learner populations, including Japanese, Chinese, Indonesian, and Taiwanese EFL learners, while systematic reviews note geographical and methodological concentration in the existing evidence. More research is therefore needed across diverse educational contexts and among teachers themselves.

Finally, insufficient attention has been given to how teachers interpret AI-generated pronunciation feedback. A system may identify a pronunciation deviation, but determining whether the deviation is pedagogically significant requires linguistic and pedagogical expertise. The central gap can therefore be expressed as follows:

While considerable literature has established the potential of AI-assisted language learning and automated pronunciation technologies, comparatively limited research has examined teachers' preparedness to integrate these technologies into English phonology instruction. In particular, insufficient attention has been paid to the interaction between teachers' phonological/content knowledge, pedagogical knowledge, technological competence, AI literacy, technological self-efficacy, and institutional support. This gap justifies further investigation into teacher preparedness as a critical condition for effective, ethical, and pedagogically appropriate AI integration in English phonology teaching.

3. Methodology

This chapter presents the methodological framework used to investigate teacher preparedness for integrating artificial intelligence into English phonology and pronunciation instruction. The study adopted a critical literature review design, which was appropriate because the purpose was to examine, compare, evaluate, and synthesize existing research rather than collect primary data from teachers or learners. The methodology was directly connected to the four research questions, particularly those concerning teachers' knowledge, competence, confidence, AI applications, facilitating and constraining factors, and gaps in existing research.

The critical literature review design was important because the study did not simply seek to summarize what previous researchers had reported. Instead, it examined the quality, methodological approaches, assumptions, contexts, and conclusions of existing studies. This allowed evidence from different studies to be compared while taking account of differences in research contexts and methodological strength. Thus, the design provided the basis for moving from a descriptive account of the literature toward a critical interpretation of the evidence.

A review protocol was then used to make the literature-selection process systematic and transparent. The protocol covered the research questions, search terms, databases, inclusion and exclusion criteria, screening, quality appraisal, data extraction, and synthesis. This was particularly significant because concepts such as AI literacy, teacher competence, self-efficacy, professional development, and institutional support can appear under different terminology in the literature. A structured protocol therefore reduced the possibility that relevant evidence would be overlooked simply because different researchers used different terms.

The search strategy drew on several academic databases, including Google Scholar, ERIC, Scopus, Web of Science, ScienceDirect, SpringerLink, and JSTOR. The range of databases reflected the interdisciplinary nature of the research, which connects applied linguistics, language education, educational technology, artificial intelligence, and teacher education. Importantly, the search was not restricted to the exact phrase "AI in phonology." Related concepts such as automated speech recognition, AI-assisted pronunciation teaching, computer-assisted pronunciation teaching, intelligent tutoring systems, generative AI, and digital language pedagogy were also considered. This broader approach was necessary because terminology in AI and language education is changing rapidly.

The search terms and Boolean operators provided a more systematic means of locating relevant literature. Searches combined concepts relating to teacher preparedness, AI, English pronunciation, phonology, teacher competence, confidence, self-efficacy, professional development, institutional support, and technological challenges. Consequently, the search strategy was capable of addressing not only the first two research questions but also the questions concerning the conditions that facilitate or constrain AI integration. Documentation of the search strings, databases, and publication periods also strengthened the reproducibility of the review. The inclusion and exclusion criteria helped establish the boundaries of the evidence base. Priority was given to peer-reviewed research relevant to English language teaching and addressing at least one of the study's central concepts. At the same time, the methodology recognized that an excessively restrictive approach could exclude valuable conceptual or emerging research in a rapidly developing field. A useful distinction was therefore maintained between sources used to establish empirical findings and sources used for theoretical or contextual understanding.

The literature then underwent systematic screening and selection. This involved removing duplicates, screening titles and abstracts, assessing full texts, and making the final selection. A PRISMA-style presentation could be used to demonstrate this process. Importantly, relevance was not judged solely by the terminology used by individual studies. For example, research using different terminology but providing evidence about automated pronunciation feedback or teacher AI competence could still contribute to the review. This made the review systematic while avoiding an unnecessarily narrow interpretation of the research topic.

Another important component was quality appraisal. The selected studies were considered in relation to the clarity of their objectives, appropriateness of methodology, transparency of data sources or participant selection, adequacy of data collection, analysis, credibility of findings, and acknowledgement of limitations. This was particularly important because the conclusions of a critical review depend not merely on the number of studies available but also on the quality of the evidence they provide. The appraisal therefore enabled the researcher to distinguish stronger evidence from studies with significant methodological limitations.

The data-extraction process provided a structured basis for comparison. Information was extracted concerning authorship and publication year, research context, methodology, participants or data sources, AI technology, phonological or pronunciation focus, major findings, limitations, and relevance to the research questions. Information about teacher knowledge, AI literacy, confidence, professional development, institutional support, and technological or ethical challenges was also considered. This meant that the review went beyond summarizing individual publications and instead created a basis for identifying patterns, convergence, and disagreement across studies.

The extracted evidence was analyzed through thematic synthesis. This was suitable because the reviewed studies differed in methodology, context, participants, and conceptual orientation. The major themes included teacher knowledge and competence, AI literacy, confidence and self-efficacy, AI applications in pronunciation and phonology instruction, professional development, institutional support, and ethical and technological challenges. Importantly, the synthesis considered not only recurring findings but also contradictions, contextual differences, and areas where evidence remained insufficient.

For example, the methodology makes it possible to distinguish between the pedagogical potential of AI and teachers' actual preparedness to use it. Evidence that AI can provide pronunciation feedback does not automatically demonstrate that teachers possess the knowledge, confidence, training, or institutional support required to integrate such technology effectively. This distinction is central to the study because the research focuses on teacher preparedness rather than simply on whether AI technologies exist or have potential educational applications.

The chapter also addresses ethical considerations, despite the absence of direct human participants. Ethical practice in a literature review involves accurate representation of previous researchers' arguments, appropriate citation, avoidance of plagiarism, transparency in selection procedures, and faithful interpretation of evidence. Particularly important is the avoidance of selective reporting. Contradictory findings should not be ignored simply because they do not support the researcher's preferred interpretation. This strengthens the credibility and balance of the review.

Several limitations of the review were also recognized. These include publication bias, differences in database coverage, variations in terminology, language restrictions, limited full-text availability, methodological differences among studies, and the rapid evolution of AI technologies. Because AI-supported phonology and pronunciation teaching is an emerging field, some of the available evidence may also come from exploratory or small-scale studies. Consequently, the findings need to be interpreted according to the nature and limitations of the available evidence rather than generalized beyond what the literature can support.

Finally, the chapter demonstrates methodological alignment with the research questions. Research Question One was addressed through evidence concerning teacher knowledge, competence, confidence, and preparedness; Research Question Two through documented AI applications in pronunciation and phonology; Research Question Three through evidence concerning professional development, institutional support, AI literacy, access, confidence, and ethical challenges; and.

The study used a critical literature review because the objective was not merely to establish what AI can do in pronunciation teaching, but to critically examine whether the existing literature demonstrates that teachers are knowledgeable, competent, confident, and adequately supported to integrate AI into English phonology and pronunciation instruction.

4. Findings and Critical Synthesis

4.1 Introduction

This section introduces the findings from the reviewed literature and explains that the chapter focuses on identifying patterns, similarities, differences, and explanations across the studies rather than merely summarizing individual sources.

4.2 Characteristics of the Reviewed Studies

The studies are described according to their:

- number and publication period;
- geographical distribution;

- research methodologies;
- educational levels and contexts; and
- types of AI technologies investigated.

These characteristics provide the context necessary for interpreting differences in the findings.

4.3 Findings on Teacher Preparedness

The literature indicates that teacher preparedness is multidimensional. It involves technological knowledge, pedagogical competence, phonological knowledge, AI literacy, assessment skills, and the ability to evaluate AI critically and ethically. Teachers may be willing to use AI without necessarily possessing the competencies required for effective classroom integration.

4.4 Findings on AI Use in Phonology

Teaching AI is used in phonology teaching for pronunciation practice, automated feedback, speech recognition, conversational practice, material generation, listening and pronunciation modelling, and personalized learning. However, the effectiveness of these applications depends largely on teachers' ability to select, interpret, adapt, and pedagogically integrate AI-generated outputs.

4.5 Teachers' Required Competencies

Effective AI-supported phonology teaching requires teachers to develop:

- AI and digital literacy;
- phonological and pronunciation knowledge;
- pedagogical competence;
- assessment and feedback skills;
- critical evaluation skills; and
- ethical awareness.

Thus, AI competence should complement rather than replace teachers' professional and linguistic expertise.

4.6 Factors Influencing Teacher Readiness

Teacher readiness is influenced by both individual and contextual factors. These include teachers' previous technological experience, confidence, attitudes, professional development, institutional support, infrastructure, internet access, technical assistance, workload, educational policies, and availability of appropriate AI tools.

4.7 Opportunities Presented by AI

AI creates opportunities for personalised learning, increased pronunciation practice, immediate feedback, instructional material development, learner autonomy, and additional support for teachers. Nevertheless, these opportunities are not automatic; their educational value depends on the quality of the technology and the teacher's ability to use it appropriately.

4.8 Challenges and Limitations

Major challenges include inaccurate or inconsistent AI feedback, inadequate teacher training, limited infrastructure, privacy concerns, algorithmic and accent bias, excessive dependence on technology, unequal access, and difficulties integrating AI into existing curricula. These challenges demonstrate the continuing importance of human teacher judgement.

4.9 Contradictions and Debates in the Literature

Differences between studies should be explained rather than simply reported. Contradictory findings may result from differences in participants, educational settings, research methods, technologies, definitions of teacher readiness, levels of institutional support, and periods in which the research was conducted.

For example, teachers may report high confidence in using AI in surveys while classroom-based studies reveal difficulties with actual pedagogical implementation. This suggests that perceived readiness and demonstrated readiness are not necessarily the same.

4.10 Critical Synthesis

The overall evidence suggests that teacher preparedness for AI-supported phonology instruction is multidimensional and context-dependent. Effective implementation requires the integration of technological, pedagogical, phonological, assessment, and ethical competencies. AI can support teachers and learners, but it does not eliminate the need for professional teacher judgement.

The literature also suggests that contextual conditions such as infrastructure, professional development, institutional support, and technology quality strongly influence whether AI can be used effectively.

4.11 Emerging Conceptual Model

The findings support a dynamic model in which teacher preparedness influences the effective selection and integration of AI into phonology teaching. Successful implementation provides teachers with experience and opportunities for professional learning, which can further strengthen preparedness.

The relationship can therefore be represented as:

Teacher Preparedness → Effective AI Integration → AI-Supported Phonology Instruction → Teacher Experience and Reflection → Professional Learning → Enhanced Preparedness

This process is influenced by contextual factors such as infrastructure, institutional support, professional development, resources, technology quality, and learner characteristics.

4.12 Overall Chapter Argument

The central argument emerging from the literature is that effective AI-supported phonology teaching depends not simply on the availability of AI technology, but on teachers' ability to combine AI literacy, phonological expertise, pedagogical knowledge, critical evaluation, and ethical awareness within supportive educational contexts.

5. Discussion, Conclusion and Recommendations

5.1 Introduction

This chapter summarizes and discusses the major findings of the study on Teacher Preparedness for Teaching English Phonology in the Era of Artificial Intelligence: A Critical Literature Review. The discussion is organized around the study objectives and focuses on teachers' phonological knowledge, AI literacy, preparedness to integrate AI into phonology teaching, opportunities and challenges, and implications for teacher education and classroom practice. The chapter concludes with recommendations, contributions, limitations, suggestions for future research, and the overall conclusion.

5.2 Summary and Discussion of Findings

5.2.1 Objective One: To examine teachers' knowledge and competence in teaching English phonology

The review indicates that effective phonology teaching requires adequate knowledge of English sounds, stress, rhythm, intonation, connected speech, and pronunciation pedagogy. Teachers need both subject knowledge and the ability to translate that knowledge into appropriate classroom activities.

The findings suggest that strong phonological knowledge remains essential in the AI era. AI tools may provide pronunciation models and feedback, but teachers need sufficient phonological knowledge to interpret, verify, and apply such information appropriately. AI therefore complements rather than replaces teachers' professional knowledge.

5.2.2 Objective Two: To examine teachers' AI literacy and technological competence

The review shows that teachers' preparedness increasingly depends on their ability to understand and use AI-supported technologies. AI literacy involves more than operating digital tools. Teachers need to evaluate AI-generated information, recognize technological limitations, protect learner data, and use AI for clearly defined pedagogical purposes.

Thus, technological access alone does not guarantee effective AI integration. Teachers require appropriate training and continuous professional development.

5.2.3 Objective Three: To examine teachers' preparedness to integrate AI into English phonology instruction

The findings indicate that teacher preparedness is multidimensional. It involves:

- phonological knowledge;
- pedagogical competence;
- technological competence;
- AI literacy;
- critical evaluation skills; and
- ethical awareness.

Prepared teachers can select appropriate AI tools, connect them to learning objectives, monitor learners' progress, and evaluate automated feedback. Consequently, AI integration should be understood as a pedagogical process rather than simply a technological innovation.

5.2.4 Objective Four: To identify the opportunities and challenges of AI-supported phonology teaching.

The literature identifies several opportunities. AI can provide individualized pronunciation practice, immediate feedback, repeated exposure to pronunciation models, learner autonomy, differentiated activities, and additional resources for teachers.

However, challenges include inaccurate automated feedback, technological limitations, unequal access to digital resources, inadequate teacher training, privacy concerns, and possible overdependence on technology.

Therefore, AI offers significant possibilities, but its educational value depends on responsible and pedagogically informed implementation.

5.2.5 Objective Five: To examine the implications of AI for English language teacher education.

The findings indicate that teacher education programmes need to respond to the changing technological environment. Pre-service and practising teachers should receive training in both English phonology and AI-supported language teaching.

AI literacy should be integrated into courses such as phonology, English language teaching methodology, educational technology, assessment, and teaching practicum. Professional development should also be continuous because AI technologies are rapidly evolving.

5.3 Implications for English Language Teacher Education

The study suggests that teacher education should develop an integrated model combining:

Phonological Knowledge + Pedagogical Knowledge + AI/Technological Competence + Ethical Awareness = Teacher Preparedness
Teacher education institutions should therefore provide practical training in AI-supported pronunciation instruction while maintaining strong foundations in English phonology and pronunciation pedagogy.

5.4 Implications for Classroom Practice

Teachers should use AI as a supplementary instructional resource rather than a replacement for professional judgement. AI can support pronunciation practice, feedback, individualized learning, and material development.

However, teachers should verify AI-generated feedback and combine technological activities with human interaction, explicit instruction, communicative practice, and teacher feedback.

5.5 Implications for Educational Policy

Educational authorities should support AI integration by:

- incorporating AI literacy into teacher standards;
- providing technological infrastructure;
- supporting continuous professional development;
- promoting equitable access to technology; and
- establishing guidelines for responsible and ethical AI use.

5.6 Recommendations Based on the findings, the study recommends that:

- English teachers should receive AI literacy training focused on language teaching and pronunciation technologies.
- Phonology-focused professional development should be strengthened.
- AI should be integrated into English language teacher education rather than treated only as a separate technological subject.
- Educational institutions should provide adequate technological infrastructure and technical support.
- Clear institutional guidelines for responsible AI use should be developed, particularly regarding privacy, accuracy, ethics, and learner protection.
- Teachers should be encouraged to critically evaluate AI-generated feedback rather than accept it automatically.

5.7 Contributions of the Study

The study contributes a conceptual understanding of teacher preparedness by connecting English phonology knowledge with AI literacy and technological competence. It also highlights the need to reconsider English language teacher education in response to emerging AI technologies.

The study's central contribution is the proposed relationship:

English Phonology Teaching

↓ Teacher Knowledge and Competence

↓ AI Literacy and Technological Competence

↓ Teacher Preparedness

↓ AI-Supported Phonology Instruction

↓ Opportunities and Challenges

↓ Teacher Education, Classroom Practice and Policy

5.8 Limitations of the Study

As a critical literature review, the study depends on existing research rather than primary classroom data. Differences among educational contexts and the rapid development of AI also limit the extent to which the findings can be generalized. Furthermore, the study does not experimentally establish the effectiveness of particular AI tools in improving pronunciation.

5.9 Suggestions for Future Research Future studies should investigate:

- teachers' actual levels of AI and phonological competence;
- teachers' experiences of using AI in phonology classrooms;
- the effectiveness of specific AI pronunciation tools;
- the accuracy of automated pronunciation feedback;
- learners' responses to AI-supported pronunciation instruction; and
- how teacher education programmes can effectively prepare teachers for AI-supported language teaching.

5.10 Conclusion

The study concludes that teacher preparedness for teaching English phonology in the era of AI depends on the integration of phonological knowledge, pedagogical competence, AI literacy, technological competence, and ethical awareness.

AI provides important opportunities for pronunciation practice, individualized learning, feedback, and instructional support. However, technological availability alone cannot guarantee effective teaching. Teachers remain central to interpreting AI outputs, making pedagogical decisions, supporting learners, and ensuring responsible use.

Therefore, the successful integration of AI into English phonology teaching requires investment in teacher education, AI literacy, phonology-focused professional development, technological infrastructure, and responsible-use policies. The future of AI-supported phonology teaching should consequently be understood not as the replacement of teachers, but as the development of better-prepared teachers who can use emerging technologies critically and effectively.

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