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The efficacy of explicit articulatory phonetics instruction in L2 pronunciation acquisition: A systematic review of pedagogical approaches for Spanish L1 Learners of English

La eficacia de la instrucción fonética articulatoria explícita en la adquisición de la pronunciación L2: Una revisión sistemática de los enfoques pedagógicos para estudiantes de español L1 que hablan inglés

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Abstract

This systematic literature review examines the efficacy of explicit articulatory phonetics instruction in improving pronunciation accuracy among Spanish L1 learners of English as a second language. Through analysis of 15 empirical studies published between 2020-2025, this review investigates how explicit instruction in manners and places of articulation affects production of challenging English phonemes, particularly interdental fricatives and vowel contrasts. The findings indicate that explicit phonetics instruction consistently outperforms traditional implicit approaches in improving segmental accuracy and comprehensibility. Key effective strategies identified include tactile feedback mechanisms, high-variability phonetic training, and visual articulation tools. However, the review also reveals significant gaps in current research, including limited longitudinal studies and insufficient investigation of transfer to spontaneous speech. The analysis suggests that while explicit articulatory instruction shows strong promise, its effectiveness is moderated by factors such as learner proficiency, instructional duration, and target phoneme complexity. These findings have important implications for curriculum design and pedagogical practices in second language pronunciation teaching.

Keywords articulatory phonetics, L2 pronunciation, Spanish L1 learners, explicit instruction, interdental fricatives, phonetic training, comprehensibility.

Resumen

Esta revisión sistemática de literatura examina la eficacia de la instrucción explícita en fonética articulatoria para mejorar la precisión de pronunciación en aprendices de inglés como segunda lengua con L1 español. Mediante el análisis de 15 estudios empíricos publicados entre 2020-2025, esta revisión investiga cómo la instrucción explícita en modos y puntos de articulación afecta la producción de fonemas ingleses desafiantes, particularmente las fricativas interdentales y los contrastes vocálicos. Los hallazgos indican que la instrucción fonética explícita supera consistentemente los enfoques implícitos tradicionales en la mejora de la precisión segmental y la inteligibilidad. Las estrategias efectivas identificadas incluyen mecanismos de feedback táctil, entrenamiento fonético de alta variabilidad y herramientas de articulación visual. Sin embargo, la revisión también revela brechas significativas en la investigación actual, incluyendo estudios longitudinales limitados e investigación insuficiente sobre la transferencia al habla espontánea. El análisis sugiere que, aunque la instrucción articulatoria explícita muestra un fuerte potencial, su efectividad está moderada por factores como la competencia del aprendiz, la duración instruccional y la complejidad del fonema objetivo. Estos hallazgos tienen implicaciones importantes para el diseño curricular y las prácticas pedagógicas en la enseñanza de la pronunciación de segundas lenguas.

Palabras clave: fonética articulatoria, pronunciación L2, aprendices de L1 español, instrucción explícita, fricativas interdentales, entrenamiento fonético, inteligibilidad.

Introduction

The acquisition of target-like pronunciation in a second language (L2) represents one of the most formidable challenges in the language learning process. While communicative language teaching approaches have historically prioritized lexical and grammatical competence, a growing body of research demonstrates that phonological errors can significantly impede intelligibility and lead to communication breakdowns, even among learners with advanced grammatical and lexical knowledge (Derwing & Munro, 2005; Saito, 2021). This is particularly true for phonemes that are absent from a learner's first language (L1) inventory, where the phenomenon of negative phonological transfer often results in persistent, fossilized errors that resist correction through traditional pedagogical approaches.

For Spanish L1 learners of English, the acquisition of certain English phonemes presents unique challenges rooted in fundamental differences between the phonological systems of both languages. The English interdental fricatives /θ/ and /ð/ constitute a particularly problematic area, as these sounds have no direct counterparts in the Spanish phonological inventory. Research by Quesada (2024) documents systematic substitution patterns among Costa Rican Spanish speakers, who typically replace the English interdentals with alveolar stops [t] and [d], leading to minimal pair confusions such as "tree" versus "three" and "den" versus "then." Similarly, English vowel contrasts pose significant difficulties, as the Spanish vowel system consists of only five pure vowels, while English has a more complex system of multiple monophthongs and diphthongs. Valenzuela and French (2023) conducted a longitudinal study demonstrating that even advanced Spanish L1 learners struggle with English vowel contrasts, particularly the tense-lax distinctions such as /iː/-/ɪ/ (as in "beat" vs. "bit") and /uː/-/ʊ/ (as in "pool" vs. "pull").

The theoretical underpinnings of these challenges can be traced to several influential models of second language acquisition. Flege's Speech Learning Model (1995) posits that the ability to perceive and produce L2 sounds diminishes with age as the L1 phonological system becomes more entrenched. Similarly, the Perceptual Assimilation Model (Best, 1995) suggests that L2 learners perceive unfamiliar sounds through the filter of their L1 phonological categories, leading to predictable patterns of substitution and approximation. These theoretical frameworks help explain why Spanish L1 learners consistently struggle with English interdental fricatives and certain vowel contrasts – these sounds either do not exist in Spanish or are perceived as equivalent to existing Spanish categories, despite important articulatory and acoustic differences.

Traditional approaches to L2 pronunciation teaching have often relied on implicit methods such as auditory mimicry, listen-and-repeat drills, and exposure to target language input. However, mounting evidence suggests that these approaches may be insufficient for addressing persistent pronunciation problems, particularly those stemming from L1 transfer. As Hunt-Gómez and Navarro-Pablo (2020) argue, "without explicit guidance, learners may remain unaware of the specific articulatory adjustments required to produce unfamiliar L2 sounds" (p. 935). Their analysis of pre-service language teachers' pronunciation errors revealed that incorrect articulations often persisted despite years of language study, negatively impacting communicative effectiveness.

In response to the limitations of implicit approaches, there has been growing interest in explicit articulatory phonetics instruction as a means of addressing persistent pronunciation difficulties. Articulatory phonetics provides a systematic framework for describing how speech sounds are produced through the coordinated movement of articulators in the vocal tract. The two central concepts in this framework – place of

articulation (where in the vocal tract a sound is produced) and manner of articulation (how the airstream is modified) – offer learners concrete parameters for adjusting their pronunciation. For instance, explicitly teaching that the English /θ/ and /ð/ are produced with an interdental place of articulation (tongue tip between or against the upper teeth) and a fricative manner (continuous airflow through a narrow constriction) provides learners with specific, actionable knowledge that can guide their production attempts.

Recent empirical studies have begun to investigate the efficacy of explicit articulatory instruction for various L2 learning contexts. Ozakin et al. (2022) demonstrated that tactile cues significantly improved the accuracy of English interdental consonants in an oral reading task, suggesting that multisensory approaches enhance the effectiveness of explicit instruction. Similarly, Gómez-Lacabex et al. (2022) found that combined perception and production training yielded significant improvements in the production of English lexical schwa by young Spanish learners. These studies represent a shift toward more nuanced understanding of how explicit phonetic knowledge can be integrated into pronunciation pedagogy.

Despite this growing body of research, several important gaps remain in our understanding of explicit articulatory instruction. First, there is limited synthesis of the specific techniques and instructional approaches that prove most effective for different learner populations and target sounds. Second, the relationship between improved segmental accuracy and overall comprehensibility requires further investigation, as noted by Saito (2021) in his meta-analysis of pronunciation factors. Third, there is insufficient research on the long-term retention of pronunciation gains resulting from explicit instruction, with most studies employing immediate post-test designs without delayed post-test measures.

This systematic literature review aims to address these gaps by synthesizing current research on explicit articulatory phonetics instruction for Spanish L1 learners of English. Specifically, this review seeks to answer the following research questions:

1. How does explicit instruction in articulatory phonetics affect the production accuracy of challenging English phonemes (particularly interdental fricatives and vowel contrasts) by Spanish L1 learners?
2. What specific instructional techniques (e.g., tactile feedback, visual aids, high-variability training) prove most effective in explicit articulatory phonetics instruction?
3. To what extent does improved segmental accuracy through explicit instruction transfer to enhanced global comprehensibility in spontaneous speech?
4. What methodological gaps exist in current research, and what directions should future studies take?

By addressing these questions, this review aims to provide a comprehensive analysis of the current state of research on explicit articulatory instruction and offer evidence-based recommendations for pronunciation pedagogy. The findings have significant implications for language teachers, curriculum designers, and materials developers seeking to implement effective pronunciation instruction grounded in phonetic science.

Theoretical Framework

The efficacy of explicit articulatory instruction can be understood through several complementary theoretical perspectives. From a cognitive standpoint, Skill Acquisition Theory (DeKeyser, 2007) provides a useful framework for understanding how explicit knowledge of articulation can transition to automatic production through deliberate practice. According to this perspective, initial explicit knowledge of place and manner of

articulation serves as declarative knowledge that, through targeted practice, becomes proceduralized and eventually automatized. This process is particularly important for L2 sounds that require novel articulatory configurations not employed in the L1.

The role of awareness and attention in L2 acquisition, as emphasized in Schmidt's (1990) Noticing Hypothesis, further supports the value of explicit instruction. By directing learners' attention to the specific articulatory gestures required for L2 sounds, explicit instruction enhances noticing of both the target forms and the gaps between their current production and the target. This heightened awareness may facilitate the restructuring of phonological representations, a process that implicit approaches may fail to trigger, especially for sounds that are perceptually assimilated to L1 categories.

From a psycholinguistic perspective, the Motor Theory of speech perception (Liberman & Mattingly, 1985) suggests a close link between speech perception and production mechanisms. Explicit articulatory instruction may strengthen this connection by providing learners with concrete reference points for both perceiving and producing challenging L2 sounds. This is particularly relevant for Spanish L1 learners acquiring English interdental fricatives, as research by Conklin et al. (2021) demonstrates that these learners often struggle with both perception and production of these sounds due to their absence in the Spanish phonological system.

Metodology

This systematic review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure comprehensive and transparent literature selection and analysis. The search strategy targeted peer-reviewed journal articles, conference proceedings, and doctoral dissertations published between 2020 and 2025. Electronic databases including Google Scholar, Scopus, ERIC, and PsycINFO were

searched using combinations of the following keywords: "articulatory phonetics," "explicit pronunciation instruction," "L2 Spanish learners," "English interdental fricatives," "phonetic training," "place and manner of articulation," and "L2 vowel acquisition."

Inclusion criteria required that studies: (1) empirically investigated explicit articulatory phonetics instruction; (2) included Spanish L1 learners of English as participants; (3) measured production outcomes; (4) were published in English or Spanish; and (5) employed experimental, quasi-experimental, or case study designs. Exclusion criteria eliminated studies that: (1) focused solely on perception without production measures; (2) examined implicit instruction only; (3) included mixed L1 backgrounds without separate analysis of Spanish speakers; or (4) were purely theoretical or descriptive without empirical data.

The initial search yielded 87 potentially relevant publications. After removing duplicates and screening titles and abstracts, 32 studies underwent full-text review. Ultimately, 15 studies met all inclusion criteria and were selected for in-depth analysis. These studies were coded for key characteristics including research design, participant profile, instructional approach, target phonemes, outcome measures, and main findings. A qualitative synthesis approach was employed to identify patterns, themes, and contradictions across the studies, with particular attention to methodological strengths and limitations.

Analysis of results and discussion

Efficacy of Explicit Instruction for Interdental Fricatives.

The reviewed literature provides compelling evidence for the effectiveness of explicit articulatory instruction in improving Spanish L1 learners' production of English

interdental fricatives. Ozakin et al. (2022) conducted a carefully controlled laboratory study demonstrating that tactile cues – specifically, having learners place their tongue between wooden spatulas while producing /θ/ and /ð/ – resulted in significant improvements in production accuracy compared to traditional auditory-only instruction. This finding highlights the value of multisensory approaches that engage proprioceptive feedback mechanisms alongside auditory and visual modalities.

Quesada's (2024) research on substitution patterns among Costa Rican Spanish speakers further illuminates the challenges learners face with interdental fricatives and the potential of explicit instruction to address them. The study documented systematic replacement of /ð/ with [d] in word-initial position and with [ɾ] in intervocalic position, patterns that reflect phonological transfer from Spanish. Importantly, Quesada noted that learners who received explicit instruction on the interdental place of articulation and fricative manner showed significantly greater improvement than those who received only implicit correction, suggesting that understanding the articulatory parameters enables learners to override L1 transfer patterns.

Wagner et al. (2021) explored the role of explicit instruction in "mitigating negative transference" in foreign language articulatory phonetics. Their study with university-level Spanish learners of English found that explicit instruction focusing on the contrast between Spanish alveolar stops and English interdental fricatives led to significant gains in production accuracy. The researchers emphasized the importance of "conscious articulatory awareness" (p. 145) in helping learners break entrenched L1-based production habits.

Vowel Contrast Acquisition Through Explicit Instruction

The challenges Spanish L1 learners face with English vowel contrasts have been well-documented, and several recent studies have investigated the role of explicit instruction in addressing these difficulties. Valenzuela and French's (2023) longitudinal study provides particularly valuable insights, tracking learners' vowel production over an 18-month period. Their findings revealed that participants who received explicit instruction on vowel articulation – including tongue height, advancement, and lip rounding – showed more rapid and sustained improvement than those who received only communicative practice.

Ortega et al. (2021) compared the effects of lexical and non-lexical high-variability phonetic training on L2 vowel production. Their results indicated that both approaches yielded significant gains, but the non-lexical training – which focused explicitly on perceptual distinctions between vowel categories – led to greater improvement in production accuracy. This finding suggests that explicit attention to phonetic detail, divorced from lexical meaning, can effectively target the articulatory adjustments needed for challenging vowel contrasts.

Conklin et al. (2021) employed acoustic analysis to examine the influence of L1 Spanish on L2 English vowel production. Their study revealed that even advanced learners maintained Spanish-like formant frequencies for certain English vowels, particularly the tense-lax distinctions. However, learners who had received explicit articulatory instruction showed formant patterns that more closely approximated native speaker productions, providing acoustic evidence for the efficacy of explicit approaches.

Instructional Techniques and Modalities

The reviewed studies employed a variety of instructional techniques within the broader framework of explicit articulatory instruction, allowing for preliminary conclusions about their relative effectiveness.

Tactile feedback mechanisms emerged as particularly promising. Building on Ozakin et al.'s (2022) work with wooden spatulas, several studies incorporated tactile cues to enhance learners' awareness of tongue placement. These approaches appear especially valuable for interdental fricatives, where visual observation is difficult and proprioceptive awareness is crucial.

Visualization tools also proved effective across multiple studies. Martoccio (2022) utilized ultrasound technology to provide real-time visual feedback on tongue position during vowel production, resulting in significant improvements in Spanish L1 learners' English vowel quality. While such technology may not be feasible in all instructional contexts, simpler alternatives such vocal tract diagrams and MRI videos also yielded positive outcomes in studies by Vásquez (2025) and others.

High-variability phonetic training, which exposes learners to target sounds produced by multiple speakers in various phonetic contexts, was another effective approach identified in the literature. Zhang and Yao (2025) demonstrated that adaptive phonetic training incorporating high variability led to significant improvements in both perception and production of English vowels among Chinese learners, and similar benefits were observed for Spanish L1 learners in studies by Ortega et al. (2021) and Gómez-Lacabex et al. (2022).

Impact on Comprehensibility and Communicative Effectiveness

While segmental accuracy is an important outcome measure, several studies investigated the relationship between explicit articulatory instruction and global comprehensibility – the degree to which listeners find speech easy to understand. Saito's (2021) meta-analysis of pronunciation factors found that instruction targeting specific, problematic segmental features had a greater impact on comprehensibility than global pronunciation instruction, supporting the focused approach characteristic of explicit articulatory training.

Hunt-Gómez and Navarro-Pablo (2020) directly addressed the communicative consequences of pronunciation errors, analyzing how specific articulation problems affected listeners' comprehension. Their findings indicated that errors with high-functional load sounds like interdental fricatives significantly impaired comprehensibility, underscoring the importance of targeting these sounds through effective instruction.

Offerman and Yelin (2022) explored an innovative approach to pronunciation instruction through social media platforms. Their study found that explicit instruction delivered via short video tutorials focusing on specific articulatory gestures led to improvements in both accuracy and comprehensibility, suggesting that technology-mediated approaches can effectively support articulatory phonetics instruction.

Discussion and synthesis

The findings from the reviewed studies collectively provide strong support for the efficacy of explicit articulatory phonetics instruction in improving Spanish L1 learners' production of challenging English sounds. However, several important patterns and considerations emerge from the synthesis of this literature.

First, the effectiveness of explicit instruction appears to be moderated by several factors, including learner proficiency, instructional duration, and target sound complexity. Studies with beginner learners often showed more dramatic improvements than those with advanced learners, possibly because beginners have less entrenched production habits. Similarly, longer instructional periods (e.g., the 18-month study by Valenzuela & French, 2023) tended to yield more substantial and durable gains than shorter interventions.

Second, while explicit instruction consistently outperformed implicit approaches, the most effective implementations typically combined explicit explanation with extensive production practice and multisensory feedback. As Vásquez (2025) argues, "knowledge of articulation must be coupled with opportunities for proceduralization through structured practice" (p. 15). This suggests that explicit instruction should be viewed not as a replacement for practice, but as a foundation that makes practice more productive and targeted.

Third, the transfer of improved segmental accuracy to spontaneous speech remains an area requiring further investigation. While several studies measured production in controlled contexts (e.g., word lists, reading passages), fewer examined whether gains generalized to unrehearsed speech. Martoccio (2022) found some evidence of transfer in a podcasting project, but more research is needed to understand the conditions that support generalization beyond instructional contexts.

Methodologically, the reviewed studies exhibited several strengths, including controlled experimental designs, acoustic analysis of production data, and in some cases longitudinal tracking of development. However, limitations included small sample sizes in several studies, lack of delayed post-test measures in others, and insufficient attention to individual differences in phonological aptitude and learning strategies.

Conclusions and Future Directions

This systematic review of 15 empirical studies published between 2020-2025 provides compelling evidence for the value of explicit articulatory phonetics instruction in L2 pronunciation teaching for Spanish L1 learners of English. The following conclusions can be drawn:

1. Explicit instruction in place and manner of articulation consistently leads to greater improvements in production accuracy of challenging English sounds, particularly interdental fricatives and vowel contrasts, compared to traditional implicit approaches.
2. Multisensory instructional techniques that incorporate tactile feedback, visual articulation tools, and high-variability training appear particularly effective in enhancing learners' articulatory awareness and control.
3. Improvements in segmental accuracy through explicit instruction contribute to enhanced global comprehensibility, though the relationship between specific articulatory improvements and overall intelligibility requires further investigation.
4. The effectiveness of explicit articulatory instruction is moderated by factors including learner proficiency, instructional duration, and target sound complexity, suggesting the need for differentiated approaches.

Several important directions for future research emerge from this review. First, there is a critical need for longitudinal studies that track the long-term retention of pronunciation gains from explicit instruction. Second, research should investigate the transfer of learning from controlled production tasks to spontaneous speech across different communicative contexts. Third, more studies are needed to explore individual differences

in responsiveness to explicit articulatory instruction, including the role of phonological memory, auditory processing abilities, and attitudinal factors.

From a pedagogical perspective, these findings support the integration of explicit articulatory instruction into pronunciation curricula, particularly for sounds that are prone to L1 transfer. However, successful implementation requires teacher training in basic articulatory phonetics and the development of appropriate instructional materials. As pronunciation instruction continues to evolve, evidence-based approaches grounded in phonetic science offer promising pathways for helping learners overcome persistent production challenges and achieve greater intelligibility in their L2 communication.

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