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STRATEGIES AND CHALLENGES IN TEACHING VOWEL DIGRAPHS FOR EFL LEARNERS: A SYSTEMATIC LITERATURE REVIEW

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Abstract || English vowel digraphs pose significant challenges for English as a Foreign Language learners due to deep orthographic irregularities and native language interference. This systematic literature review investigates teachers' challenges and material preparation strategies for mitigating these linguistic barriers. Following PRISMA guidelines, 74 articles across major databases were rigorously screened, yielding 8 highly relevant peer-reviewed studies for thematic synthesis. The analysis reveals a critical phonetic gap; notably, studies show that most of EFL students lack adequate grapheme-phoneme knowledge for digraph decoding. To mitigate this, educators are abandoning native-centric textbooks in favor of targeted pedagogical strategies. Integrating technology-enhanced language learning tools and explicit phonics instruction significantly improves decoding accuracy. Furthermore, bespoke phonics-based pronunciation innovations demonstrated high efficacy, has significant instructional efficiency scores in targeted classrooms. Ultimately, overcoming orthographic barriers requires explicit phonetic instruction and the localized development of bespoke, technology-enhanced teaching materials to master irregular spelling patterns.

Keywords || English vowel digraphs; EFL teaching materials; Phonics instruction; Orthographic complexity; Systematic literature review

Abstrak || Digraf vokal bahasa Inggris menimbulkan tantangan signifikan bagi pembelajar bahasa Inggris sebagai bahasa asing akibat ketidakteraturan ortografi yang kompleks dan interferensi bahasa ibu. Tinjauan literatur sistematis ini menyelidiki tantangan guru dan strategi penyiapan bahan ajar untuk mengatasi hambatan linguistik tersebut. Mengikuti panduan PRISMA, 74 artikel awal dari berbagai basis data utama disaring secara ketat, menghasilkan 8 studi penelaahan sejawat untuk sintesis tematik. Analisis mengungkap kesenjangan fonetik yang kritis; studi menunjukkan bahwa sekitar 50% mahasiswa tingkat awal tidak memiliki pengetahuan grafem-fonem yang memadai untuk mendekode digraf. Untuk mengatasinya, para pendidik mulai meninggalkan buku teks yang berpusat pada penutur asli dan beralih ke strategi pedagogis yang ditargetkan. Integrasi alat pembelajaran bahasa berbasis teknologi dan instruksi fonik eksplisit terbukti meningkatkan akurasi decoding secara signifikan. Selanjutnya, inovasi bahan ajar pelafalan berbasis fonik yang dirancang khusus menunjukkan efikasi tinggi, mencapai skor efisiensi instruksional yang signifikan di dalam kelas. Kesimpulannya, mengatasi hambatan ortografis membutuhkan instruksi fonetik eksplisit dan pengembangan bahan ajar lokal berbasis teknologi untuk menguasai pola ejaan yang tidak beraturan.

Katakunci || Digraf vokal bahasa Inggris; Bahan ajar bahasa Inggris; Instruksi fonik; Kompleksitas ortografi; *Systematic literature review*

Introduction

The global proliferation of English as a lingua franca has necessitated an unprecedented focus on the efficacy of English as a Foreign Language (EFL) and English as a Second Language (ESL) instruction. Within this educational paradigm, the acquisition of accurate pronunciation and decoding skills remains one of the most persistent barriers for non-native speakers. The complexities embedded within the English spelling system create a formidable hurdle for learners, requiring them to constantly decipher and understand the highly nuanced, often unpredictable rules and patterns that govern the written language. This specific pedagogical challenge is not merely an isolated aspect of language learning; rather, it is a fundamental, structural component that significantly shapes the overall linguistic proficiency, speaking confidence, and reading comprehension of English language learners (Putra, 2023). The discrepancy between spoken phonology and written orthography in English creates a cognitive dissonance that impedes fluid language processing. Consequently, achieving a high level of communicative competence requires a deep, often explicit, understanding of orthographic irregularities, a factor that is frequently underestimated in communicative-based language curricula.

A comprehensive survey of current literature reveals that the pronunciation of specific orthographic structures, particularly English vowel digraphs, presents a unique and significant challenge for non-native speakers across diverse educational contexts. Vowel digraphs are pairs of letters representing a single distinct vowel sound which are epitomize the complex and frequently contradictory nature of English orthography. Difficulties arise primarily because of the historical evolution of the English language, which has resulted in a deep orthography characterized by a lack of one-to-one correspondence between graphemes and phonemes. Furthermore, these challenges are inextricably linked to the phonological influence of the learners' native language. The phonetic inventory of English contains numerous vowel sounds, including specific diphthongs and nuanced vowel qualities produced by digraphs, that simply do not exist in the linguistic repertoires of many EFL learners. However, contemporary language instruction often prioritizes communicative fluency over mechanical accuracy, leading to a systemic marginalization of phonetic instruction. This ongoing need for a more concentrated focus on teaching fundamental phonetic and phonemic skills directly and adversely affects

students' ability to pronounce, decode, and ultimately understand vocabulary words correctly in a broader linguistic context (Putra, 2023).

The primary research problem central to this phenomenon can be elucidated through the framework of the Orthographic Depth Hypothesis (Wang & Li, 2025; Buetler et al., 2014; Schmalz et al., 2016). The core difficulty lies in the drastic contrast between the spelling systems of the learners' native languages (L1) and the target language (L2) (Bajo et al., 1994). English is categorized as having an opaque, or deep, orthography, meaning that its spelling system is highly inconsistent and irregular. In contrast, languages such as Bahasa Indonesia, along with a vast array of regional languages, possess a highly transparent, or shallow, orthography (Yap et al., 2010). In these languages, the grapheme-to-phoneme mapping is exceptionally consistent, with one letter reliably representing one specific, invariable sound. When learners from transparent linguistic backgrounds attempt to navigate the opaque English system, a profound cognitive clash occurs. This drastic typological difference is the primary catalyst for L1 interference, or negative phonological transfer. Learners instinctively apply the strict, consistent decoding rules of their native transparent orthography to the highly irregular English vowel digraphs, resulting in persistent pronunciation errors, spelling difficulties, and hampered reading fluency.

General pedagogical solutions to the challenges of L1 interference and orthographic opacity have traditionally relied on broad, immersive language exposure and rote memorization of vocabulary (Sarimsakova et al., 2025). Historically, educators have utilized whole-word reading approaches or generic phonics drills that attempt to bypass the inherent complexities of the spelling system. Teachers frequently encourage students to memorize the shapes of words or rely heavily on context clues to determine pronunciation. While these general solutions may yield superficial vocabulary acquisition in the short term, they ultimately fail to equip learners with the autonomous decoding skills necessary to tackle unfamiliar lexicons independently (Hussain and Ahmed, 2025). Relying on rote memorization to master the thousands of irregular vowel digraph combinations in English places an unsustainable cognitive load on the learner (Lysenko et al., 2024). As a result, when these general strategies are applied in the EFL classroom, they often result in the fossilization of incorrect pronunciation patterns and a persistent plateau in reading

comprehension, failing to address the root cause of the orthographic mismatch.

To systematically address the profound pronunciation and decoding challenges stemming from orthographic irregularities, scholars advocate for highly specific, specialized pedagogical interventions. Extensive research indicates that targeted instruction and deliberate, focused practice are absolutely essential components of an effective phonological curriculum. This targeted approach moves beyond passive exposure, actively engaging the learner's phonemic awareness through structured, explicit phonetic exercises. Such instruction includes rigorous exercises that focus intensely on distinguishing between acoustically similar vowel sounds often represented by confusingly similar digraphs and physically practicing the articulatory mechanics required for complex diphthongs and unfamiliar phonemes (Abker, 2020). By implementing targeted instruction, educators can explicitly teach the dominant patterns and the frequent exceptions of vowel digraphs, thereby providing learners with a systematic framework to navigate the opaque orthography rather than leaving them to decipher it through mere guesswork.

Furthermore, literature highlights the strategic utilization of Contrastive Analysis (CA) as a highly potent specific solution to mitigate the effects of L1 interference. Using contrastive analysis allows educators and curriculum designers to systematically compare the structural, phonological, and orthographic properties of English with the learners' native language. This analytical approach can successfully predict and identify specific linguistic areas where the learner's L1 is most likely to interfere with the accurate acquisition of English pronunciation and spelling rules. By mapping the exact phonetic gaps and orthographic divergences between a transparent L1 and the opaque L2, educators can shift from a reactive teaching model to an anticipatory one. This empirical approach can directly guide the development of highly customized teaching materials, tailored lesson plans, and specific remedial strategies that directly address the unique cognitive and phonetic hurdles experienced by the target demographic (Kurniasy et al., 2023).

Despite the established theoretical efficacy of targeted phonetic instruction and contrastive analysis, a critical review of closely related literature reveals a substantial gap in practical application, particularly concerning the development and deployment of educational resources.

Currently, there is a pronounced limitation in the availability of appropriate teaching materials designed specifically to address the nuances of English vowel digraphs in foreign language contexts. The vast majority of existing phonics materials, textbooks, and interactive phonetic modules are structurally designed for native English-speaking children. Consequently, these materials implicitly assume a pre-existing, robust oral vocabulary and an intuitive cultural understanding of the language, focusing merely on mapping known sounds to letters. This native-centric paradigm makes such materials fundamentally inadequate and contextually irrelevant for EFL learners, who require a drastically different pedagogical approach that simultaneously introduces the novel sound, its corresponding irregular orthography, and its semantic meaning. Furthermore, while theoretical frameworks identify the problem, there is a scarcity of empirical literature documenting the actual, on-the-ground pedagogical realities of this issue. Specifically, there is limited comprehensive data on how EFL teachers strategize, adapt, and innovate to overcome the severe challenges posed by the lack of standard rules (irregularities) in vowel digraphs when teaching in resource-constrained classrooms that lack appropriately localized materials.

Therefore, this study aims to systematically review and critically analyze the current literature regarding the challenges faced by EFL teachers in preparing and utilizing teaching materials for English vowel digraphs, as well as the specific pedagogical strategies they employ to mitigate orthographic irregularities in the classroom. The primary novelty of this research lies in its deliberate departure from native-speaker-centric phonological studies, focusing exclusively on the unique pedagogical dynamics of teaching opaque English digraphs to learners accustomed to transparent orthographic systems. By synthesizing the dispersed qualitative and quantitative findings on teacher-generated strategies and material adaptations, this study seeks to answer the critical research question of how educators navigate the lack of standardized phonetic rules during classroom instruction. The scope of this study is strictly confined to a Systematic Literature Review (SLR) encompassing peer-reviewed empirical studies, pedagogical frameworks, and curriculum analyses published within the last decade, focusing specifically on the intersection of EFL instruction, orthographic depth, and vowel digraph pedagogy.

Methodology

The present study adopts a Systematic Literature Review design to examine, evaluate, and synthesize existing pedagogical frameworks concerning the instruction of English vowel digraphs in foreign language contexts (Višić, 2022). A systematic review methodology was selected because it provides a highly structured, transparent, and replicable process for aggregating empirical evidence from diverse geographical and educational settings (Kumar, 2023). To ensure the highest standard of methodological rigor and to systematically mitigate inherent selection biases, this research strictly adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The application of the PRISMA framework facilitates a meticulous, step-by-step documentation of the literature identification, screening, eligibility assessment, and final inclusion phases. By employing this standardized approach, the study guarantees that the synthesized findings accurately reflect the current state of academic discourse regarding the formidable hurdles learners face when deciphering nuanced orthographic rules, specifically navigating the opaque nature of English vowel digraphs in classrooms constrained by a lack of standardized phonetic regulations.

The primary literature identification phase was executed through a comprehensive and highly targeted search strategy across multiple prominent electronic academic databases. Recognizing the multifaceted nature of the research problem, the search strategy was designed to capture literature intersecting linguistic theory, educational psychology, and practical classroom pedagogy. The systematic retrieval of relevant scholarly documents was operationalized using a specific Boolean search string carefully formulated to encapsulate the core thematic variables of the investigation. The exact search string deployed across the digital repositories was: "vowel digraph" AND (challenge* OR "teaching strategies" OR "teaching materials") AND EFL. This syntactical formulation ensured that the search engine algorithms prioritized manuscripts that explicitly addressed the targeted orthographic structures while simultaneously filtering for pedagogical interventions and the contextual parameter of English as a Foreign Language. The initial execution of this comprehensive search string across various academic indexing platforms yielded a preliminary corpus of seventy-four distinct articles, which subsequently served as

the foundational dataset for the subsequent rigorous screening and filtering procedures.

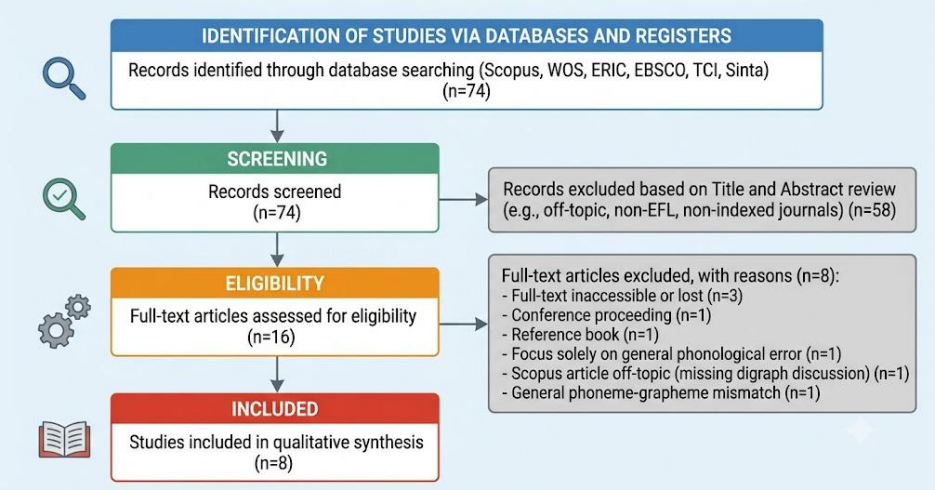


Figure 1. Article Selection Process

To ensure that the synthesized evidence maintained the highest academic rigor and absolute relevance to the formulated research questions, a stringent set of inclusion criteria was established and systematically applied to the initial pool of 74 retrieved documents. A primary criterion for inclusion was the academic reputation and indexing status of the publishing journals, ensuring the validity and peer-reviewed quality of the underlying empirical data. For domestically published literature within the Indonesian context, articles were exclusively considered if they were published in journals holding at least a formal accreditation from the Science and Technology Index (Sinta). Concurrently, for the international spectrum of literature, inclusion was strictly limited to manuscripts published in journals indexed by globally recognized and reputable databases, specifically including Scopus, Copernicus, the Education Resources Information Center (ERIC), the Web of Science (WOS), EBSCO, and the Thai-Journal Citation Index (TCI). Furthermore, beyond the indexing prerequisites, the thematic content of the articles had to explicitly align with the primary objectives of the study. Consequently, articles were only deemed eligible for final inclusion if their core narrative fundamentally analyzed the specific challenges associated with English vowel digraphs, explored the development or evaluation of dedicated teaching materials for these linguistic structures, or proposed specific pedagogical strategies aimed at overcoming the irregular grapheme-to-phoneme correspondences inherent in the English spelling system.

Following the establishment of the inclusion parameters, a rigorous exclusion protocol was implemented to systematically filter out manuscripts from the initial yield of seventy-four articles that failed to meet the stringent methodological and thematic standards. The screening process adhered strictly to the established boundaries, resulting in the deliberate removal of several specific publications. Specifically, one article was excluded from the final synthesis because it was identified as a conference proceeding, thus lacking the comprehensive peer-review depth characteristic of full-length journal articles required for this review. Additionally, three separate articles were eliminated from consideration because their full texts could not be accessed or were permanently lost within the digital repositories, preventing the necessary in-depth methodological scrutiny. The thematic screening further refined the dataset by eliminating literature that superficially touched upon related topics without addressing the core phenomenon of vowel digraphs. Consequently, one article was excluded for focusing exclusively on general phonological errors without linking them to the specific pedagogical challenges of orthographic decoding. Another document was discarded as it functioned merely as a theoretical reference book rather than an empirical research study. Furthermore, one highly indexed Scopus article was removed because, despite exploring broad reading problems, it completely lacked a focused discussion on digraph instruction. Finally, one additional article was excluded because its analysis was entirely restricted to the macro-level concept of phoneme-grapheme mismatch, failing to provide the specific, granular insights into vowel digraph pedagogy required to answer the primary research question.

The systematic execution of these inclusion and exclusion criteria effectively distilled the initial extensive search yield down to a highly focused, relevant, and methodologically sound corpus of literature. The step-by-step filtration process successfully eliminated all tangential, inaccessible, and non-peer-reviewed materials, thereby safeguarding the integrity of the systematic review. Upon the completion of the rigorous PRISMA screening flow, a final definitive set of eight empirical research articles was selected for comprehensive qualitative synthesis and profound thematic data extraction. This final collection of literature encompasses a diverse array of global educational contexts, reflecting the universal challenge that English vowel digraphs pose to non-native speakers across varying linguistic backgrounds. The methodologies, specific objectives, and primary

outcomes of these eight carefully selected manuscripts provide a robust empirical foundation for analyzing how modern educators navigate the complexities of opaque English orthography through targeted instructional design and strategic material preparation.

To facilitate a structured and transparent analysis of the finalized literature corpus, a standardized data extraction protocol was developed and systematically applied to the eight included manuscripts. Pertinent variables including the author identities, publication years, core research objectives, the specific reputable indexing databases housing the articles, and the ultimate empirical results were meticulously extracted from each full text. This systematic organization of data allows for the clear identification of converging themes, pedagogical trends, and potential gaps in the current academic landscape regarding phonics instruction. The comprehensively extracted data from the eight final articles, which form the empirical backbone of this systematic literature review, are systematically presented and detailed in the subsequent tabulation.

Table 1. Classification by Indexing Database

Indexing Category	Author (Year)	Objective / Focus	Key Findings
SCOPUS & WOS	Schwartz & Kahn-Horwitz (2016)	Examined the impact of Arabic vs. Hebrew L1 on English basic literacy acquisition.	L1 orthographic proximity influences digraph decoding; however, silent <e> remained a universal challenge.
	Russak (2022)	Investigated longitudinal EFL spelling development among Semitic L1 speakers.	EFL spelling error types are significantly influenced by the linguistic distance between the learners' L1 and English.
	Al-Jarf (2015)	Evaluated mind-mapping software for EFL vocabulary instruction.	Experimental groups utilizing mind-maps demonstrated significantly higher accuracy and gains in vocabulary acquisition.
	Rashid & Malik (2026)	Investigated TELL tools for phonics acquisition in under-resourced schools.	TELL significantly improved phonics skills, with females showing exceptional progress in advanced concepts like digraphs and diphthongs.
EBSCO	Putra (2023)	Assessed the effectiveness of phonics instruction on EFL university students.	Explicit phonics instruction significantly improved pronunciation and specific vowel digraph (<ai>) decoding.
	Mrambo et al. (2022)	Assessed phonological awareness (PA) in primary school reading.	L1 (Kiswahili) interference caused significant difficulties in decoding

Indexing Category	Author (Year)	Objective / Focus	Key Findings
			digraphs and irregular grapheme-phoneme correspondences.
ERIC	Almekhlafy (2021)	Investigated university students' Grapheme-Phoneme (GP) knowledge.	Approximately 50% of students lacked adequate GP knowledge, particularly concerning graph/digraph to vowel phonemes mapping.
TCI (Tier 1)	Sukkrong et al. (2026)	Developed and evaluated a phonics-based pronunciation innovation set.	The implemented innovation drastically improved pronunciation achievement and received high student satisfaction.

Results and Discussion

The systematic extraction and thematic synthesis of the eight included empirical studies yielded a comprehensive understanding of the multifaceted challenges and subsequent pedagogical strategies associated with teaching English vowel digraphs in Foreign Language (EFL) contexts. Following the rigorous screening procedures outlined in the methodology, the finalized corpus of literature was subjected to a granular thematic analysis to answer the primary research inquiries. The data revealed that the complexities of navigating opaque English orthography are not localized but represent a universal pedagogical hurdle spanning diverse linguistic and geographical boundaries. To systematically present these findings, the extracted data were categorized into three distinct, yet interconnected, thematic domains that encapsulate the core phenomena observed in the classroom. The first theme delineates the foundational challenges stemming from native language interference and the inherent complexity of English orthography. The second theme explores the innovative material developments and technological interventions that educators deploy to circumvent these structural barriers. Finally, the third theme examines the evaluation of baseline grapheme-phoneme knowledge alongside the efficacy of explicit instructional applications within the classroom. A synthesized overview of this thematic classification, highlighting the core objectives and key findings of each foundational study, is presented in Table 2 below.

Table 2. Thematic Classification of Included Studies Detailing Core Challenges, Teacher Strategies, And Classroom Applications Regarding English Vowel Digraph Instruction.

Thematic Focus	Author (Year)	Objective / Focus	Key Findings
Theme 1: Native Language (L1) Interference & Orthographic Complexity (Focus: Core challenges)	Schwartz & Kahn-Horwitz (2016)	Impact of L1 (Arabic/Hebrew) on English decoding.	Orthographic distance between L1 and English dictates the difficulty in spelling English digraphs.
	Mramboa & Ligembe (2022)	PA evaluation and Kiswahili interference.	Mother tongue interference directly impedes the decoding of digraphs and irregular word patterns.
	Russak (2022)	EFL spelling development in Semitic L1 speakers.	Phonological and orthographic errors are largely attributable to native language characteristics.
Theme 2: Technological Interventions & Material Innovation (Focus: Teacher strategies & materials)	Al-Jarf (2015)	Utilization of mind-mapping software for teaching.	Visual software approaches are highly effective in retaining accurate vocabulary knowledge.
	Rashid & Malik (2026)	TELL usage in resource-constrained environments.	Technology-enhanced tools effectively facilitate the mastery of complex concepts, including digraphs.
	Sukkrong et al. (2026)	Development of phonics-based pronunciation materials.	Purpose-built phonics innovation materials significantly elevate student pronunciation scores.
Theme 3: Grapheme-Phoneme Evaluation & Explicit Phonics Instruction (Focus: Classroom application)	Putra (2023)	Effectiveness of direct phonics instruction.	Targeted phonics interventions successfully improve the decoding of specific vowel digraphs.
	Almeklafy (2021)	Evaluation of basic GP knowledge (including digraphs).	Highlights the critical need for further instruction, as half of the learners struggled with digraph-to-vowel mapping.

Native Language (L1) Interference and Orthographic Complexity

The first major thematic cluster emerging from the systematic review underscores the profound and disruptive influence of a learner's native language (L1) when attempting to decode the highly opaque English

spelling system. The synthesized literature conclusively demonstrates that the primary challenge educators face is not rooted in the cognitive deficits of the learners, but rather in the stark typological and orthographic distances between the learners' mother tongues and the target language. This phenomenon is intricately detailed in the comparative study conducted by Schwatz et al. (2016), which examined the impact of Arabic and Hebrew language backgrounds on the acquisition of English literacy skills. Their empirical findings provided robust support for the orthographic proximity hypothesis, revealing that the specific orthographic distance between the L1 and English directly dictates the level of difficulty a learner will experience in spelling and decoding English digraphs. While certain linguistic parallels offered isolated advantages, the overarching inconsistency of English vowel digraphs, such as the unpredictable nature of the silent "e" convention, remained a formidable, universal challenge for all non-native participants regardless of their specific Semitic background. This strongly aligns with the theoretical paradigms established earlier, emphasizing that a deep, opaque orthography fundamentally clashes with the decoding instincts developed in more transparent native languages.

The pervasive nature of L1 interference is further corroborated by research conducted in entirely different linguistic contexts, proving that the phenomenon is globally applicable. In their assessment of phonological awareness among primary school students in Tanzania, Mrambo et al. (2022) discovered that mother tongue interference, specifically from Kiswahili, directly and severely impeded the students' ability to decode English digraphs and process irregular word patterns. The study documented observable, systematic errors, such as the improper insertion of phonemes within consonant blends and word finals, which were direct manifestations of the learners forcibly applying Kiswahili phonetic rules to English orthography. This highlights the critical necessity of understanding a learner's phonetic starting point. The longitudinal implications of these interferences were subsequently mapped by Russak (2022), who investigated the trajectory of English spelling development among Semitic L1 speakers over several academic years. Russak (2022) concluded that phonological and orthographic errors are not merely transient developmental phases but are deeply and persistently attributable to the unique characteristics of the native language.

These collective findings validate the assertions made by Kurniasy et al. (2023), who posited that employing contrastive analysis is an indispensable pedagogical prerequisite. By systematically identifying the precise areas of linguistic friction where the L1 disrupts English pronunciation, educators can anticipate error patterns and construct preemptive, highly tailored instructional strategies rather than relying on generalized corrective feedback.

Technological Interventions and Material Innovation

The second distinct theme extracted from the literature shifts the focus from diagnosing the structural challenges to exploring the specific pedagogical strategies and material innovations educators employ to overcome the lack of standardized phonetic rules in English. A definitive consensus across the reviewed studies indicates that traditional, native-centric phonics textbooks are vastly insufficient for EFL learners. Consequently, educators and researchers are increasingly turning toward purpose-built material innovations and technological interventions to bridge the orthographic gap. The empirical efficacy of such bespoke material development is clearly demonstrated by Sukkrong et al. (2026), who engineered and evaluated a specialized phonics-based pronunciation innovation set. The deployment of this highly targeted material resulted in a drastic elevation of student pronunciation scores, successfully meeting stringent pedagogical efficiency criteria while simultaneously generating high levels of student satisfaction. This indicates that when learning materials are purposefully designed to address the specific mechanical challenges of phonics, rather than relying on passive immersion, learners can successfully navigate the complexities of vowel digraphs.

Parallel to material engineering, the strategic integration of specialized technology serves as a potent pedagogical catalyst in modern EFL classrooms. Rashid and Malik (2026) addressed a critical gap in the literature by investigating the implementation of Technology-Enhanced Language Learning (TELL) tools specifically tailored for phonics acquisition in under-resourced public schools. Their key findings revealed that technology-enhanced tools effectively and significantly facilitate the mastery of notoriously complex phonetic concepts, including the decoding of opaque digraphs and diphthongs. Notably, their study highlighted demographic nuances, demonstrating that such technological interventions are particularly beneficial in narrowing learning disparities and accelerating advanced skill acquisition among

specific student cohorts. Furthermore, moving beyond purely audio-lingual technologies, Al-Jarf (2015) highlighted the profound impact of visual cognitive tools by utilizing mind-mapping software for vocabulary teaching. The findings demonstrated that visual software approaches are highly effective in retaining accurate vocabulary knowledge. By allowing students to visually map the irregular relationships between complex graphemes and their corresponding phonemes, educators provide a spatial and organizational framework that mitigates the cognitive overload associated with rote memorization. These technological and material innovations collectively represent a vital paradigm shift, equipping teachers with dynamic, interactive, and visually explicit resources necessary to dismantle the opaque barriers of the English spelling system.

Grapheme-Phoneme Evaluation and Explicit Phonics Instruction

The final thematic domain synthesized from the systematic review scrutinizes the baseline realities of learner comprehension and the critical necessity of implementing explicit, targeted phonics instruction within the classroom environment. While material innovation is crucial, the literature underscores that the delivery mechanism specifically the explicitness of the instruction is paramount to achieving phonetic accuracy. The urgent need for such instructional paradigms is starkly illuminated by the diagnostic research conducted by Almeklafy (2021), who evaluated the foundational Grapheme-Phoneme (GP) knowledge of first-year university EFL students. The results were highly indicative of systemic educational shortcomings, revealing that approximately fifty percent of the participating learners lacked adequate baseline GP knowledge. Most notably, the students exhibited profound difficulties precisely at the juncture of mapping English graphs and complex digraphs to their corresponding vowel phonemes. This diagnostic study highlights a critical pedagogical gap, demonstrating that without explicit and sustained phonics instruction during formative learning years, non-native speakers often arrive at the tertiary educational level fundamentally unequipped to independently decode the unpredictable nature of English orthography.

To directly address these systemic gaps in phonetic proficiency, the literature advocates for a departure from generalized, communicative-only approaches in favor of highly targeted, explicit phonetic interventions. The empirical validation for this prescriptive approach is provided by Putra (2023), who investigated the precise

effectiveness of direct phonics instruction on EFL learners. The study revealed that when pedagogical efforts were intentionally concentrated on the mechanics of spelling, targeted phonics interventions successfully and significantly improved the students' capacity to accurately decode specific, highly irregular vowel digraphs, such as the grapheme. Furthermore, Putra (2023) noted that such targeted instruction not only improved mechanical decoding skills but also fostered positive learner attitudes, as students inherently recognized the crucial link between explicit phonetic mastery and their broader literacy improvement. These classroom-level findings empirically substantiate the theoretical framework championed by Abker (2020), which asserts that generalized exposure is insufficient; rather, overcoming pronunciation challenges strictly requires targeted instruction and deliberate practice that focuses meticulously on distinguishing between visually similar digraphs and practicing the complex articulatory mechanics of unfamiliar vowel sounds. Ultimately, the synthesis of this literature confirms that educators must systematically evaluate their students' baseline phoneme-grapheme correspondences and actively implement explicit, highly structured phonics instruction to successfully navigate the irregularities of the English vowel system.

As a result, unifying thread across the reviewed literature is that overcoming the inherent irregularities of English vowel digraphs necessitates a paradigm shift from generalized language exposure to highly intentional, localized pedagogical engineering. The literature confirms that teachers cannot rely on standard, native-centric textbooks to navigate the opaque English spelling system; instead, they must actively bridge the orthographic gap by functioning as material innovators and strategic facilitators. By synergizing contrastive analysis to anticipate L1 interference with the deployment of explicit phonics instruction, visual cognitive mapping, and technology-enhanced learning environments, educators can systematically demystify the lack of standardized phonetic rules. This synthesis definitively illustrates that mitigating digraph challenges in the EFL classroom requires a structured instructional environment, where bespoke teaching materials and targeted, explicit teaching strategies work in tandem to transform unpredictable orthographic irregularities into accessible and masterable phonetic patterns for non-native learners.

Conclusion

This systematic literature review establishes that the opaque nature of English vowel digraphs presents a formidable pedagogical challenge in EFL classrooms, primarily driven by native language interference and significant orthographic distance. To navigate these persistent spelling and pronunciation irregularities, the findings demonstrate that educators cannot rely on traditional, native-centric learning materials. Instead, successful mitigation necessitates highly explicit phonics instruction coupled with localized material innovation. The synthesized evidence reveals that when teachers deploy targeted technological interventions such as Technology-Enhanced Language Learning (TELL) tools and visual cognitive strategies like mind-mapping, non-native learners can effectively decode complex grapheme-phoneme correspondences. The primary pedagogical implication is that EFL curricula must transition from passive communicative exposure to systematic, contrastive-based phonetic instruction that explicitly deconstructs structural spelling inconsistencies.

This study contributes to the existing educational linguistics body of knowledge by decentering native-speaker phonological frameworks, highlighting instead the critical necessity of context-specific instructional engineering for learners accustomed to transparent orthographies. By synthesizing fragmented pedagogical strategies, this review provides a cohesive evidence base for educator interventions. To further advance this field, future research must shift from diagnostic and observational paradigms toward practical. Subsequent inquiries should focus on designing, empirically testing, and validating interactive digraph teaching modules and culturally responsive phonetic curricula. Specifically, there is an urgent need to engineer specialized, adaptable instructional materials tailored to specific L1 demographics, thereby empowering teachers to effectively dismantle orthographic barriers even within under-resourced educational environments.

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