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Vowel-Related Spelling Errors among Sudanese Secondary School EFL Learners: A Quantitative Error Analysis

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Abstract

Accurate spelling represents a fundamental component of successful written communication in English as a Foreign Language (EFL). Despite extensive research on spelling difficulties among EFL learners, limited attention has been devoted to vowel-related spelling errors in the Sudanese educational context, particularly those involving complex vowel structures such as diphthongs and triphthongs. This study investigates the nature and frequency of vowel-related spelling errors among Sudanese secondary school students and examines the linguistic and cognitive factors contributing to these difficulties. A descriptive quantitative research design was employed. Data were collected through a structured spelling test administered to fifty third-year secondary school students enrolled in a private school in Khartoum North, Sudan. The instrument included lexical items representing short vowels, long vowels, central vowels, diphthongs, and triphthongs. The collected data were analyzed using frequencies, percentages, and chi-square analysis. The findings revealed high error rates across all vowel categories, with central vowels and triphthongs presenting the greatest difficulty. Substitution and omission emerged as the most frequent error patterns. The results further suggest that cross-linguistic interference from Arabic, limited phonological awareness, and insufficient instructional emphasis on spelling patterns may be the cause behind learners' spelling difficulties. The study concludes with pedagogical implications emphasizing explicit phonological instruction and the integration of pronunciation-based spelling activities in EFL classrooms.

Keywords: Arabic-speaking learners, error analysis, EFL learners, Phonological awareness, Spelling accuracy, Vowel representation.

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أخطاء التهجئة المتعلقة بالأصوات المتحركة لدى متعلمي اللغة الإنجليزية كلغة أجنبية في المدارس الثانوية السودانية: دراسة تحليلية كمية للأخطاء

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ملخص:

تُعد دقة التهجئة ركيزة أساسية للتواصل الكتابي الناجح باللغة الإنجليزية كلغة أجنبية (EFL). وعلى الرغم من وفرة الأبحاث التي تناولت صعوبات التهجئة لدى متعلمي هذه اللغة، إلا أن الاهتمام بالأخطاء المتعلقة بالأصوات المتحركة (vowels) في السياق التعليمي السوداني ظل محدودًا، لا سيما تلك المتعلقة بالبُنى الصوتية المركبة مثل الأصوات المتحركة المزدوجة (diphthongs) والثلاثية (triphthongs). تهدف هذه الدراسة إلى استقصاء طبيعة ومعدلات تكرار الأخطاء الإملائية المرتبطة بالأصوات المتحركة لدى طلاب المدارس الثانوية السودانية، وفحص العوامل اللغوية والمعرفية المسببة لهذه الصعوبات. وقد اعتمدت الدراسة منهجًا وصفيًا كميًا، حيث جُمعت البيانات عبر اختبار تهجئة مقنن طُبِّق على خمسين طالبًا وطالبة من طلاب الصف الثالث الثانوي في مدرسة خاصة بمدينة الخرطوم بحري في السودان. وتضمن الاختبار مفردات تمثل الأصوات المتحركة القصيرة، والطويلة، والوسطية (central vowels)، والمزدوجة، والثلاثية. وجرى تحليل البيانات باستخدام التكرارات، والنسب المئوية، واختبار "مربع كاي" (chi-square). وأظهرت النتائج ارتفاع معدلات الخطأ في جميع فئات الأصوات المتحركة، حيث شكلت الأصوات المتحركة الوسطية والثلاثية التحدي الأكبر؛ كما تبين أن "الاستبدال" و"الحذف" هما أكثر أنماط الخطأ شيوعًا. وتشير النتائج أيضًا إلى أن التداخل اللغوي من اللغة العربية، ومحدودية الوعي الفونولوجي (الصوتي)، وعدم التركيز الكافي في التدريس على أنماط التهجئة، تُعد عوامل رئيسية قد تكون سببًا في زيادة صعوبات التهجئة لدى المتعلمين. وتختتم الدراسة بتقديم توصيات تربوية تؤكد على أهمية التدريس الصريح للجوانب الفونولوجية ودمج أنشطة التهجئة القائمة على النطق في فصول اللغة الإنجليزية كلغة أجنبية.

الكلمات المفتاحية: متعلمون ناطقون بالعربية، تحليل الأخطاء، متعلمو اللغة الإنجليزية كلغة أجنبية، الوعي الفونولوجي، دقة التهجئة، تمثيل الأصوات المتحركة.

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Introduction:

English has become an international language of communication, education, research, and professional advancement, making proficiency in its four language skills essential for learners worldwide. Among these skills, writing occupies a central position in academic achievement, and accurate spelling constitutes one of the most fundamental components of effective written communication. In English as a Foreign Language (EFL) context, spelling competence plays a significant role in learners' academic performance, written intelligibility, and overall linguistic development.

However, mastering English spelling remains a considerable challenge for many EFL learners due to the irregular nature of English orthography. Unlike languages characterized by transparent sound–symbol correspondence, English demonstrates a deep orthographic system in which the relationship between phonemes and graphemes is often inconsistent. As a result, learners frequently encounter difficulties when attempting to map spoken sounds onto written forms, particularly in words containing complex vowel structures.

Among the various components of English spelling, vowel representation constitutes one of the most problematic areas. English vowels are characterized by phonological variability, multiple graphemic representations, and contextual pronunciation shifts. A single vowel sound may be represented by several orthographic patterns, while one grapheme may correspond to multiple phonetic realizations. Such complexity becomes even more apparent in diphthongs and triphthongs, which require learners to perceive and encode multiple vocalic elements within a single syllable.

For Arabic-speaking learners, these challenges become more pronounced due to substantial phonological differences between Arabic and English. Arabic possesses a relatively transparent orthographic system and a comparatively limited vowel inventory. Consequently, Arabic-speaking learners often rely on first-language phonological patterns when spelling English words, leading to errors such as vowel substitution, omission, insertion, and misrepresentation. Previous studies have confirmed that first-language interference remains a major predictor of spelling difficulties among Arab EFL learners.

Although spelling difficulties among Arab learners have received increasing scholarly attention, research specifically investigating vowel-related spelling errors among Sudanese secondary school learners remains scarce. More specifically, little empirical attention has been devoted to learners' difficulties with complex vowel categories such as central vowels, diphthongs, and triphthongs in the Sudanese EFL context. This gap highlights the need for focused research that examines how vowel complexity influences spelling performance among Sudanese learners.

Accordingly, this study seeks to investigate vowel-related spelling errors among Sudanese secondary school EFL learners by addressing the following research questions:

1. What types of vowel-related spelling errors are most frequently produced by Sudanese secondary school EFL learners?
2. To what extent does vowel complexity influence learners' spelling accuracy?
3. What linguistic and instructional factors contribute to vowel-related spelling difficulties among Sudanese learners?

Based on these questions, the objectives of the study are to identify dominant vowel-related spelling error patterns, examine the relationship between vowel complexity and spelling performance, and propose pedagogical strategies that may improve spelling instruction in Sudanese EFL classrooms.

Literature Review

English Orthography and Spelling Challenges in EFL Contexts

Spelling competence is widely recognized as an essential component of writing proficiency and literacy development in second and foreign language learning. Accurate spelling not only contributes to written intelligibility but also reflects learners' phonological, morphological, and orthographic knowledge. However, English spelling presents considerable challenges for EFL learners because of the irregular nature of its orthographic system. Unlike languages characterized by transparent grapheme–phoneme correspondence, English demonstrates what researchers describe as *deep orthography*, where the relationship between sounds and written symbols is often unpredictable.

According to) Ehri (2020), successful spelling development depends on learners' ability to establish stable orthographic mappings between phonological representations and written forms. Similarly, Cook (2021) argues that second-language learners often experience spelling difficulties because they attempt to apply phonetic strategies to an orthographic system that does not consistently reflect pronunciation. This mismatch frequently leads to inaccurate written production, especially when learners encounter unfamiliar lexical items.

Recent empirical studies confirm that spelling difficulties remain one of the most persistent challenges among EFL learners across educational contexts. For instance, Kang and Han (2021) found that limited phonological awareness significantly predicts spelling inaccuracy among second-language learners, particularly when learners are required to process unfamiliar sound patterns. These findings suggest that spelling performance is influenced not only by vocabulary knowledge but also by learners' ability to analyze and manipulate phonological information.

Vowel Representation as a Source of Spelling Difficulty

Among the multiple dimensions of English spelling, vowel representation has consistently been identified as one of the most problematic areas for EFL learners. English vowels are characterized by phonetic variability, contextual pronunciation changes, and multiple orthographic realizations. A single vowel phoneme may correspond to several graphemic patterns, while one grapheme may represent different sounds depending on lexical and phonological context.

According to Treiman and Kessler (2021), vowel spelling requires learners to integrate phonological perception, orthographic memory, and lexical retrieval simultaneously. This multidimensional processing becomes increasingly difficult when learners encounter long vowels, reduced vowels, diphthongs, or triphthongs.

Similarly Al-Seghayer (2020) emphasizes that vowel distinctions in English represent a major source of confusion for Arab learners due to the inconsistency of English vowel realization. Learners frequently substitute, omit, or misrepresent vowel graphemes because they cannot accurately discriminate between similar vowel sounds during auditory processing.

Recent research conducted by Al-Jarf (2022) further demonstrates that vowel-related spelling errors occur more frequently than consonant-related errors among Arabic-speaking EFL learners. Her findings indicate that learners commonly confuse vowel length distinctions and often simplify complex vocalic combinations by replacing unfamiliar patterns with more familiar orthographic forms.

Cross-Linguistic Influence among Arabic-Speaking Learners

Cross-linguistic influence, commonly referred to as first-language interference, remains one of the most widely discussed explanations for spelling difficulties among EFL learners. According to interlanguage research, learners tend to transfer phonological and orthographic features from their native language when producing written forms in a second language.

Arabic differs substantially from English in both vowel inventory and orthographic depth. Whereas Arabic contains a relatively small set of vowel contrasts and demonstrates consistent sound–symbol correspondence, English contains a broader and more variable vowel system. This discrepancy creates significant challenges for Arabic-speaking learners.

Research conducted by Alqahtani (2023) indicates that Arabic-speaking EFL learners frequently rely on native-language phonological categories when attempting to spell English words. As a result, learners often fail to distinguish between central vowels, long vowels, and complex vowel clusters. Similar findings were reported by Al-Seghayer (2020), who concluded that Arabic learners' spelling performance is strongly influenced by cross-linguistic transfer and limited exposure to authentic spoken English.

In the Sudanese context, these challenges may become more pronounced due to limited instructional resources, reduced exposure to natural spoken English, and classroom practices that often prioritize memorization over phonological analysis. However, despite these contextual challenges, empirical research focusing specifically on vowel-related spelling errors among Sudanese learners remains limited.

Sudanese Spoken Arabic and English Vowel Spelling

The first language that Sudanese learners use in daily life is Sudanese Spoken Arabic (SSA) rather than Modern Standard Arabic, and its phonology may shape how English vowels are perceived and encoded in writing. Three dialectal features are particularly relevant. First, Arabic dialects, including those spoken in Sudan, typically monophthongize the Classical Arabic diphthongs /aw/ and /aj/ into long mid vowels such as [oː] and [eː]. Learners may therefore treat English diphthongs and triphthongs as single long vowels and fail to encode their second vocalic element. Second, vowel length is phonemic in Arabic, and dialectal lengthening of vowels in stressed or open syllables may blur the English contrast between tense and lax vowels (e.g., /**ɪ**/ vs. /iː/), affecting the spelling of short and long vowels. Third, Arabic dialects commonly insert a short epenthetic vowel to break up consonant clusters, which may promote vowel insertion errors in English, while the absence of a reduced central vowel category may promote omission or arbitrary substitution of the schwa. In addition, Arabic script ordinarily leaves short vowels unmarked (they appear only as optional diacritics), so Arabic-literate learners are accustomed to writing words without short vowels, which may contribute to vowel omission in English. These features are treated here as testable predictions, because the present instrument did not record learners' dialectal pronunciation directly.

Cognitive Factors in Spelling Development

Beyond linguistic interference, spelling development is influenced by several cognitive factors, including phonological awareness, working memory, lexical retrieval, and orthographic processing. Phonological awareness refers to learners' ability to identify, segment, and manipulate sound units within words, and it has consistently been identified as a strong predictor of spelling accuracy.

According to Perfetti and Stafura (2021), accurate spelling depends on the development of stable lexical representations that allow learners to retrieve orthographic patterns automatically. Learners with limited lexical exposure often rely on sound-based approximation strategies, which increase the likelihood of vowel substitution and omission.

Furthermore, recent intervention studies suggest that explicit phonological instruction and pronunciation-focused activities significantly improve spelling performance among EFL learners. These findings indicate that spelling should be viewed not merely as a memorization skill but as a complex cognitive process involving phonological discrimination, pattern recognition, and lexical storage.

Theoretical Framework

This study is grounded in Error Analysis Theory, originally developed by Corder (1974). Error Analysis views learner errors as systematic indicators of underlying linguistic knowledge rather than random mistakes. According to this framework, learner errors provide valuable insights into the developmental processes involved in second-language acquisition.

Within this framework, spelling errors are interpreted as evidence of learners' attempts to construct internal linguistic systems while negotiating differences between first-language knowledge and target-language structures. Vowel-related errors such as substitution, omission, and insertion may therefore reflect developmental stages in learners' phonological and orthographic acquisition.

Additionally, the study draws on Interlanguage, proposed by Selinker (1972), which explains how learners develop intermediate linguistic systems influenced by both native-language transfer and target-language exposure. Together, these frameworks provide an appropriate theoretical lens for examining vowel-related spelling errors among Sudanese EFL learners.

Models of Orthographic Acquisition

To move beyond the counting of errors, the study also draws on two models of orthographic processing. Psycholinguistic Grain Size Theory (Ziegler & Goswami, 2005) proposes that readers and spellers map between sounds and letters at different grain sizes (phoneme–grapheme, rime, whole word) and that the most efficient grain size depends on the consistency of the orthography. Learners whose L1 supports small-grain, one-to-one sound–letter mapping are expected to carry that strategy into English, where vowel spellings are more predictable at larger grains such as rimes. They should therefore produce phonologically plausible but orthographically incorrect vowel spellings, especially for central vowels, diphthongs, and triphthongs, whose spellings are least predictable at the phoneme level.

Dual-route models (Coltheart et al., 2001) distinguish a lexical route, which retrieves stored word-specific orthography, from a sublexical route, which applies conversion rules between sounds and letters. By analogy, in spelling, substitutions that preserve the target pronunciation (e.g., *machene* for *machine*) indicate reliance on sublexical phoneme-to-grapheme conversion because the lexical entry is absent or weak, whereas the omission of silent letters (e.g., *hous* for *house*) indicates incomplete lexical orthographic representations.

Together, these models generate predictions that go beyond frequency counts: (a) phonologically plausible errors should predominate where lexical orthographic knowledge is weak; (b) vowel categories with many possible spellings should show the highest error rates; and (c) errors that follow Arabic mapping or dialectal features should reflect L1 transfer. Substitution, omission, and insertion serve as the first-level

classification, and the phonological plausibility of errors is treated as a second-level interpretive criterion in the Discussion.

Research Gap

Although previous studies have investigated spelling difficulties among Arab EFL learners, few studies have examined vowel-related spelling errors among Sudanese secondary school learners using quantitative error analysis. More specifically, limited empirical attention has been devoted to the spelling of central vowels, diphthongs, and triphthongs within the Sudanese educational context. Therefore, this study seeks to address this gap by providing empirical evidence on the relationship between vowel complexity and spelling among Sudanese EFL learners. Existing studies also rarely consider the phonology of Sudanese Spoken Arabic (e.g., monophthongization, vowel lengthening, and schwa insertion) or interpret errors with models of orthographic acquisition such as Grain Size Theory and dual-route models, which limits their diagnostic precision. The present study addresses this limitation by offering dialect-informed and model-based interpretations of the observed errors.

Research on vowel spelling errors and Arabic first-language (L1) transfer among EFL learners is well established, and this study does not claim to introduce new theoretical constructs, diagnostic tools, or pedagogical models. Its contribution is incremental and context-specific. It provides descriptive evidence from Sudanese learners, a population that remains under-researched; it identifies design limitations of the test that was used; and it proposes a redesigned instrument for future research. Theoretical models and dialectal features are discussed only as possible interpretive lenses and were not tested.

Method

Research Design

This study employed a descriptive quantitative research design to investigate vowel-related spelling errors among Sudanese secondary school learners of English as a Foreign Language (EFL). A quantitative approach was considered appropriate because the study sought to measure the frequency, distribution, and statistical significance of spelling errors across different vowel categories. Moreover, descriptive error analysis enabled the researcher to identify recurring error patterns without manipulating instructional or linguistic variables.

The study was further informed by error analysis procedures, which allowed the systematic classification, quantification, and interpretation of learners' spelling errors according to specific phonological categories.

Error analysis served as the descriptive first stage. To probe the underlying mechanisms rather than count errors alone, the interpretation of error types was guided by the grain size and dual-route frameworks

described in the Theoretical Framework, together with the dialectal features of Sudanese Spoken Arabic. The study did not employ experimental psycholinguistic measures (e.g., phonological awareness tests, working-memory tasks, or response times), so claims about cognitive mechanisms are interpretive and exploratory.

Participants

The participants in this study consisted of **50 third-year secondary school students** enrolled in a private secondary school located in **Khartoum North**, Sudan. The sample included **25 male students and 25 female students**, with ages ranging from approximately 16 to 18 years.

A purposive sampling technique was employed to select participants who met the following criteria:

- Enrollment in the final year of secondary education
- At least six years of formal English instruction
- Exposure to the Sudanese national English curriculum (SPINE series)
- Comparable educational and linguistic backgrounds

The selection of third-year students was considered appropriate because learners at this stage are expected to demonstrate relatively advanced spelling competence and greater exposure to academic English compared with lower-grade learners.

Taken together, these inclusion criteria describe a narrow sample: all participants came from one private school in Khartoum North, and no public school was included. Because socioeconomic background, instructional quality, and out-of-school exposure to English were neither measured nor controlled, the findings describe this group only and cannot be generalized to Sudanese secondary school learners as a whole. This point is taken up again in the Limitations of the Study.

Table 1: Participants' demographic information.

Variable	Category	Frequency	Percentage
Gender	Male	25	50%
Gender	Female	25	50%
Educational Level	Grade 12	50	100%

Research Instrument

Data were collected using a researcher-developed spelling test designed specifically to assess learners' ability to represent English vowel sounds accurately in written form.

The instrument consisted of **12 carefully selected lexical items** representing five major vowel categories:

- short vowels
- long vowels
- central vowels

- diphthongs
- triphthongs

The selected words were chosen based on three criteria:

1. phonological complexity
2. frequency of occurrence in secondary-level instructional materials
3. documented difficulty in previous EFL spelling studies

Each item required students to listen to an orally presented word and reproduce its correct orthographic form in writing.

The inclusion of multiple vowel categories allowed the researcher to compare spelling performance across different levels of phonological complexity.

However, the instrument has important limitations. The test comprised 12 items: two each for short vowels, long vowels, central vowels, and diphthongs, and four for triphthongs. With so few items per category, category-level scores are unstable, since a single error shifts a two-item category score by 50%, and the instrument should be regarded as a brief screening measure rather than a full diagnostic test. In addition, on phonological review, several items combine syllable structure with more than one vowel type (items 1–6 and 11, e.g., *committee*, *teacher*, *machine*, *science*) and cannot be assigned to a single vowel category without qualification (see Appendix A). Category-level results are therefore interpreted with caution. A revised 40-item instrument (eight single-category items per category, monosyllabic wherever the category allows) is proposed in Appendix A2 as a design for future research only. It has not been administered to the present sample or to any other sample, and it has not been validated. This is a limitation of the present study, and none of the results reported here depend on it.

Content Validity

To ensure content validity, the test was submitted to three specialists in applied linguistics and English language teaching for expert evaluation.

The experts were asked to assess:

- Appropriateness of lexical selection
- Phonological representativeness
- Clarity of administration instructions
- Suitability for secondary school learners

Based on their recommendations, minor modifications were introduced to lexical selection and item sequencing before final administration.

Reliability

The instrument's reliability was established through a pilot administration with 10 students who shared characteristics similar to those of the main study participants but were excluded from the final sample.

Because the test items are scored dichotomously (correct/incorrect), internal consistency is appropriately estimated with the Kuder–Richardson Formula 20 (KR-20; Kuder & Richardson, 1937) or Cronbach's alpha, not with Pearson's r. A pilot of 10 students is also too small to give a stable reliability estimate. The earlier coefficient (r = 0.89) has therefore been withdrawn. KR-20 will be computed from the full response matrix of the main study (N = 50) and, for the revised instrument, from a pilot of at least 30 learners. KR-20 = [value to be inserted after recalculation].

Data Collection Procedures

Data collection was conducted during regular classroom sessions under controlled instructional conditions.

The administration procedure involved the following steps:

First, participants received standardized instructions explaining the purpose and procedures of the task. Second, each target word was pronounced clearly by the teacher twice with brief pauses between repetitions. Third, students were instructed to write the words individually without consulting peers, dictionaries, or external resources. The total administration time was approximately 10 minutes. To minimize external variables, all participants completed the test under identical classroom conditions, including similar seating arrangements, acoustic conditions, and instructional pacing.

Error Classification Procedures

After data collection, learners' written responses were carefully examined and classified according to error type. The identified spelling errors were categorized into three major types:

- vowel substitution
- vowel omission
- vowel insertion

Each response was independently reviewed and coded according to its corresponding phonological error pattern.

Data Analysis

The collected data were analyzed using descriptive and inferential statistical procedures.

Descriptive statistics included:

- Frequencies
- Percentages

- Mean error distribution

Inferential analysis was conducted using **Chi-square test** to determine whether statistically significant differences existed among vowel categories.

The significance level was set at: $p < 0.05$

The analysis specifically examined the relationship between vowel complexity and spelling accuracy across the five phonological categories.

Recalculation. All percentages and category totals were recalculated from the word-level counts of correct and incorrect spellings (25 responses per word, 75 per category). The short-vowel error rate is corrected to 76.0% (18 correct out of 75). The chi-square test was recomputed on the pooled responses (see Results) and is indicative only, because the same students answered several words. Values for central vowels, error types, gender, and reliability could not be traced to the available records and are under verification.

Ethical Considerations

Before data collection, institutional approval was obtained from the school administration. Participants were informed that their responses would be used exclusively for academic research purposes. Confidentiality and anonymity were maintained throughout data collection, coding, and statistical analysis.

Results

The present study investigated vowel-related spelling errors among Sudanese secondary school EFL learners across five vowel categories: short vowels, long vowels, central vowels, diphthongs, and triphthongs. The analysis focused on identifying error frequencies, comparing error distribution across vowel categories, and determining whether vowel complexity significantly influenced spelling performance.

Overall Error Distribution

The analysis revealed that participants experienced considerable difficulty across all vowel categories. However, error rates varied according to phonological complexity.

Table 2 presents the distribution of spelling errors across the five vowel categories.

Table 2

Distribution of Spelling Errors across Vowel Categories

Vowel Category	Error Frequency (%)	Accuracy (%)
Short Vowels	76.0	24.0
Long Vowels	81.3	18.7
Central Vowels	84.0	16.0
Diphthongs	73.3	26.7
Triphthongs	82.7	17.3

Note. The short-vowel row was recalculated from the word-level counts (18 correct out of 75). The central-vowel row could not be traced to those records and is under verification.

As shown in Table 2, **central vowels** produced the highest error rate (84.0%), followed by **triphthongs** (82.7%) and **long vowels** (81.3%). In contrast, **short vowels** showed an error rate of 76.0%, only slightly above diphthongs (73.3%), which had the lowest rate; the differences between categories were small.

These findings suggest that spelling accuracy tends to be lower for the more complex vowel categories, although the pattern is not strictly linear: diphthongs (73.3%) showed a lower error rate than long vowels (81.3%)

Error Types

A detailed analysis of learners' written responses identified three major error categories:

- vowel substitution
- vowel omission
- vowel insertion

Among these, substitution and omission errors were considerably more frequent than insertion errors.

Table 3 presents the distribution of error types.

Table 3

Distribution of Identified Error Types

Error Type	Frequency	Percentage
Substitution	87	48.1
Omission	71	39.2
Insertion	23	12.7

The results indicate that **substitution errors** represented nearly half of all identified spelling errors, suggesting that learners attempted to represent vowel sounds but frequently selected inappropriate graphemic forms.

Examples of common learner errors included:

- *ather* instead of *other*
- *cmeti* instead of *committee*

These examples demonstrate learners' tendency to rely on phonetic approximation rather than stable orthographic representations.

Comparison across Vowel Complexity

To examine whether vowel type significantly influenced spelling performance, a **Chi-square test** was conducted.

The analysis produced the following result:

Recalculated from the word-level counts (four categories, 75 responses each): $\chi^2(3, N = 300) = 2.57, p = .46$.

The obtained value does not indicate statistically significant differences among the four vowel categories for which word-level records exist. It is indicative only, because the same students answered several words and responses are therefore not independent.

Therefore, the null hypothesis could not be rejected, and no conclusion that vowel type affects spelling accuracy can be drawn from these data.

Gender-Based Comparison

An additional comparison was conducted to explore possible differences between male and female participants.

Table 4 presents the overall error rates by gender.

Table 4

Spelling Error Distribution by Gender

Gender	Mean Error Rate (%)
Male	77.4
Female	75.8

Although male participants produced slightly higher error rates than female participants, the difference was minimal and did not appear pedagogically significant.

This suggests that vowel-related spelling difficulties are primarily associated with linguistic complexity rather than gender differences.

Summary of Findings

The results of the present study reveal four major findings:

1. Sudanese secondary school EFL learners experience substantial difficulty in spelling English vowels accurately.
2. . Error rates tend to be higher for the more complex vowel structures, although not strictly in a linear way.
3. Central vowels, long vowels, and triphthongs represent the most problematic vowel categories.
4. Substitution and omission are the dominant error patterns, reflecting learners' reliance on phonetic approximation strategies.

Discussion

The findings of the present study provide strong empirical evidence that vowel representation constitutes a major source of spelling difficulty among Sudanese secondary school learners of English as a

Foreign Language (EFL). The consistently high error rates observed across all vowel categories suggest that learners experience persistent challenges in accurately mapping spoken vowel sounds onto written English forms.

One of the most significant findings of the study is the clear relationship between vowel complexity and spelling performance. As demonstrated in the results section, error rates were lowest for short vowels and highest for central vowels and triphthongs, with long vowels also showing high error rates and diphthongs falling in between. This finding suggests that learners experience greater difficulty when processing vowel structures that require multiple layers of phonological discrimination and orthographic encoding.

This finding is ~~who~~ consistent with the work of Al-Jarf (2022), , who reported that vowel-related spelling errors occur more frequently than consonant-related errors among Arabic-speaking EFL learners. Similarly, the present findings support those reported by , reported by Kang and Han (2021),who found that limited phonological awareness significantly predicts spelling inaccuracy in second-language contexts.

The exceptionally high error rate observed in central vowels deserves particular attention. Unlike Arabic, English contains reduced vowel sounds such as schwa /ə/, which frequently occur in unstressed syllables and often undergo contextual phonetic variation. Because Arabic does not provide equivalent phonological representations, Sudanese learners may struggle to perceive and reproduce such vowel patterns accurately. This interpretation supports cross-linguistic transfer theory, which suggests that learners frequently rely on native-language phonological categories when processing unfamiliar second-language input.

Similarly, the high error rates observed in triphthongs, and diphthongs indicate that learners experience substantial difficulty when dealing with complex vocalic combinations. These structures require learners to identify multiple vowel qualities within a single syllabic unit while simultaneously retrieving appropriate orthographic representations. Such processing places a considerable cognitive load on learners, particularly when orthographic patterns are irregular.

Another important finding concerns the dominance of substitution and omission errors. The prevalence of substitution errors suggests that learners attempt to approximate target pronunciations using familiar orthographic patterns derived either from prior English exposure or native-language phonological knowledge. Omission errors, on the other hand, may indicate incomplete phonological perception or limited orthographic memory.

These findings can also be interpreted from the perspective of Interlanguage, which views learner output as a developing linguistic system influenced by both first-language transfer and target-language exposure. The identified spelling patterns suggest that Sudanese learners are actively constructing

intermediate orthographic systems that have not yet fully accommodated the complexity of English vowel representation.

The orthographic models and the dialectal features discussed above allow a more precise reading of the error patterns. Substitutions that preserve the target pronunciation, such as *machene* for *machine*, are consistent with small-grain phoneme–grapheme mapping (Ziegler & Goswami, 2005) or reliance on a sublexical route (Coltheart et al., 2001) when the whole-word orthographic representation is weak. Omissions such as *hous* for *house* point to incomplete lexical orthography for silent letters, while the loss of unstressed vowels in *cmeti* for *committee* is consistent with the lack of a schwa category in Arabic and with the Arabic practice of leaving short vowels unwritten. The error *ather* for *other*, in which the vowel is replaced by the letter *a*, is compatible with the mapping of English /ʌ/ onto the nearest Arabic short vowel, /a/. Likewise, difficulty with diphthongs and triphthongs may partly reflect monophthongization in spoken Arabic, which makes the second vocalic element less salient. These readings are interpretive: the study did not code phonological plausibility systematically or record learners' dialectal pronunciation, so they must be tested in future work with larger, dialect-profiled samples and tasks that tap phonological awareness and lexical retrieval directly.

From an instructional perspective, the findings suggest that spelling difficulties are not solely caused by linguistic differences but may also reflect limitations in current classroom practices. In many EFL classrooms, spelling instruction often emphasizes memorization and written repetition while providing limited opportunities for phonological training, pronunciation practice, or multisensory learning.

Therefore, the findings of this study extend previous research by providing empirical evidence from the Sudanese context and by highlighting the vulnerability of central vowels, diphthongs, and triphthongs in learner spelling performance.

Pedagogical Implications

The findings of this study carry several important implications for English language teaching in Sudanese and similar Arabic-speaking EFL contexts.

First, spelling instruction should move beyond rote memorization toward explicit phonological instruction. Teachers should systematically introduce learners to vowel distinctions, vowel length contrasts, and stress-related vowel reduction.

Second, pronunciation activities should be integrated into spelling instruction. Listening to discrimination tasks, minimal-pair exercises, and guided repetition may help learners develop more accurate phonological representations.

Third, particular instructional attention should be devoted to:

- central vowels
- diphthongs
- triphthongs
- multisyllabic lexical items

These phonological categories should be introduced progressively through structured classroom practice.

Fourth, digital learning resources, pronunciation software, and audiovisual materials may provide learners with repeated exposure to authentic vowel production and immediate corrective feedback.

Finally, teacher training programs should place greater emphasis on phonological awareness instruction and error-based spelling intervention strategies.

Limitations of the Study

Despite its contributions, the present study has several limitations.

First, the study was conducted with a relatively small sample of fifty participants drawn from a single private secondary school in Khartoum North, which may limit the generalizability of the findings.

Second, the study focused exclusively on written spelling performance and did not examine learners' real-time phonological processing during oral production.

Third, the research adopted a quantitative design and therefore did not explore learners' perceptions, learning strategies, or classroom experiences in depth.

Fourth, the sample was drawn from a single private school, so public schools and variables such as socioeconomic background, instructional quality, and exposure to English were not represented; the findings cannot be generalized beyond the participating learners. Fifth, the instrument was short (12 items, two to four per vowel category), several items combined more than one vowel type, and its reliability has yet to be re-estimated with an appropriate coefficient (KR-20) on adequate samples. Sixth, learners' dialectal pronunciation was not recorded, and the phonological plausibility of errors was not coded systematically. Finally, the statistical results are provisional until they have been recalculated and verified by a statistician.

Future research may address these limitations by employing larger samples, multiple educational settings, and mixed-method designs.

Future studies should use 40–50 items (eight to ten per category, with monosyllabic controls), sample both public and private schools, record learners' spoken dialect, compute KR-20 or Cronbach's alpha, and add tasks derived from grain size and dual-route models (e.g., phonological awareness, lexical decision, and spelling-to-dictation of regular and irregular words).

Conclusion

The present study investigated vowel-related spelling errors among Sudanese secondary school learners of English as a Foreign Language and examined the influence of vowel complexity on spelling performance. The findings revealed that learners experience substantial difficulty across all examined vowel categories, with central vowels, long vowels, and triphthongs representing the most problematic areas.

The study further found that the differences among the vowel categories were small and not statistically significant, and that substitution and omission errors were present in learners' spellings.

By focusing specifically on the Sudanese educational context, the present study offers exploratory, descriptive evidence on vowel-related spelling errors among the participating third-year learners of one private school. Because the sample was drawn from a single private school and the instrument was brief, the findings should be treated as exploratory and should not be generalized beyond the participating learners, including to Arabic-speaking EFL learners more broadly. The results suggest that instructional approaches that integrate phonological awareness, pronunciation training, and explicit orthographic instruction deserve further investigation as ways to improve spelling accuracy and overall writing proficiency, but this study did not test those approaches. A revised 40-item test is proposed in Appendix A2, but it has not been administered to the study sample or to any other sample and has not been validated; it is offered only as a design for future research, and this is a limitation of the present study.

References

Al-Jarf, R. (2022). Spelling errors among Arab EFL learners: Causes and pedagogical implications. *Asian EFL Journal, 29*(3), 112–130.

Alqahtani, M. (2023). The impact of phonological awareness on spelling accuracy among Saudi EFL learners. *Arab World English Journal, 14*(2), 45–60. https://doi.org/10.24093/awej/vol14no2.3

Al-Seghayer, K. (2020). *Unique challenges of English learning in the Arab world*. Springer. https://doi.org/10.1007/978-3-030-32954-4

Coltheart, M., Rastle, K., Perry, C., Langdon, R., & Ziegler, J. (2001). DRC: A dual route cascaded model of visual word recognition and reading aloud. *Psychological Review, 108*(1), 204–256. https://doi.org/10.1037/0033-295X.108.1.204

Cook, V. (2021). *Second language learning and language teaching* (5th ed.). Routledge. https://doi.org/10.4324/9781351006711

Corder, S. P. (1974). Error analysis. In J. P. B. Allen & S. P. Corder (Eds.), *Techniques in applied linguistics* (pp. 122–154). Oxford University Press.

Ehri, L. C. (2020). Orthographic mapping in the acquisition of sight word reading, spelling memory, and vocabulary learning. *Scientific Studies of Reading, 24*(1), 1–21. https://doi.org/10.1080/10888438.2019.1679084

Kang, E., & Han, Z. (2021). The role of phonological awareness in second language spelling development. *Language Teaching Research, 25*(4), 567–584. https://doi.org/10.1177/1362168820912354

Kuder, G. F., & Richardson, M. W. (1937). The theory of the estimation of test reliability. *Psychometrika, 2*(3), 151–160. https://doi.org/10.1007/BF02288391

Perfetti, C. A., & Stafura, J. (2021). Word knowledge in a theory of reading comprehension. *Scientific Studies of Reading, 25*(1), 22–37. https://doi.org/10.1080/10888438.2020.1785712

Selinker, L. (1972). Interlanguage. *International Review of Applied Linguistics in Language Teaching, 10*(1–4), 209–231. https://doi.org/10.1515/iral.1972.10.1-4.209

Treiman, R., & Kessler, B. (2021). *How children learn to write words*. Oxford University Press. https://doi.org/10.1093/oso/9780198792689.001.0001

Ziegler, J. C., & Goswami, U. (2005). Reading acquisition, developmental dyslexia, and skilled reading across languages: A psycholinguistic grain size theory. *Psychological Bulletin, 131*(1), 3–29. https://doi.org/10.1037/0033-2909.131.1.3