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Optimality-Theory Approach to Account Spelling Errors in the Essay Writing of ESL Students' Register in Pakistan

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ABSTRACT

The current study investigates the nature and patterns of spelling errors in the English essay writing of Pakistani English students enrolled in BS English programs in educational institutions across Pakistan, employing the theoretical framework of Optimality Theory (OT). Drawing on the essays collected from 100 BS English students, the current study categorizes spelling errors into substitutions, phonetic, homophone confusion, omission or deletion, transpositions, and morphological errors. Through OT analysis, the study identifies the constraint interactions that underlies these errors such as the priorities of phonological faithfulness over orthographic accuracy or markedness constraints shaped by first language phonology and grammar. The study reveals that a significant proportion of errors occur due to the influence of L1 transfer, misunderstandings of English rules, and the misapplication of morphological markers in writings by Pakistani students. The study demonstrates how ranking conflicts among the constraints for recurrent patterns in students' misspellings. The study concludes with phonological and morphological applications, recommending targeted strategies to improve spelling and orthographic competence in ESL students in Pakistani English.

Introduction

English is used as official language in Pakistan (Mir, 2024). In Pakistan, English is a language which is considered prestigious for securing jobs and proving higher status in all fields of life. Mir and Afsar (2024) state that morphology and phonology of English affect the pronunciation of English and Pakistani learners struggle because of unfamiliarity with English language structure. Similarly, these structures affect the spelling of ESL learners when they write essays in English language.

In English essay writing, Pakistani students make several types of errors that affect clarity and professionalism in writing, and students lose marks in exams. These errors include phonological

errors due to the sound of the words, homophone confusion occurring due to the similarity of sound among words, omission or deletion error occurring due to the accidental left of the letters, transposition errors involving swapping the order of words and the major reason of these errors are influence of native languages and misunderstandings of L2 spelling rules.

In ESL contexts such as Pakistan, mastering spelling is challenging due to the complex and inconsistent relationship between English phonology and orthography. Moreover, this challenge is coupled with the first language phonological and orthographic systems, which affect the performance of the students in essay writing where clarity and precision are critical. Richard (2015) states that accurate spelling is vital for obtaining competence in written communication in English, as it directly impacts clarity, reader comprehension, and credibility of the text. Moreover, he suggested techniques of writing such as systematic instructions, which lead to competence in spelling in English.

In Pakistani ESL learners writing, spelling errors such as phonetic errors, overgeneralization of rules, homophones confusion and typological errors occur due to linguistic constraints and incorrect learning techniques applied by students for learning spelling. There are number of studies which describe types and frequency of spelling errors, few have attempted to describe the phenomenon from theoretical perspective that accounts for the interaction between linguistic constraints. Optimality Theory (OT) was originally developed in phonology, offering a powerful lens through which spelling errors can be analyzed and described. OT provides a systematic technique for explaining why certain spelling errors occur as optimal for ESL learners in Pakistani context given the situations in which L1 influence L2 learning process. OT is effective for describing how orthographic accuracy competes with phonological faithfulness, and how markedness constraints related to English writing system are ranked in the ESL learners' lexicon.

The current study aims to describe the spelling errors found in the Pakistani English essay writing of BS students enrolled in Pakistani educational institutions, with the objective of categorizing errors and explaining their occurrence through Optimality-Theory framework. By analyzing and mapping the errors in OT tableaux, the current research seeks to identify the constraints interactions underlying these errors. The study contributes to both theoretical linguistics, by extending the application of OT to orthographic competence, and to language pedagogy in ESL classrooms in Pakistan.

Literature Review

Spelling competence (Fischer et al., 1985), plays vital role in learners' written English proficiency, and overcoming orthographic irregularities and L1 transfer effects. English spelling poses challenges to L2 learners of Pakistani English, because of difference in phonology and orthography of English (Fischer et al., 1985). Errors reflect the learners' evolving interlanguage and can inform pedagogy (Corder, 1974). Similarly, morphological aspects in linguistics are important for overcoming the morphological errors in ESL context as substitution, deletion and addition in spelling are due to morphological structures of words. As humans are shifting to technology and using technology for doing daily works especially writing, their language is affected especially spelling of words in English. In broader perspective, theoretical frameworks discuss cognitive and linguistic underpinnings of spelling errors.

The linguistic theory asserts that spelling competence is dependent on phonological, morphological, orthographic and semantic knowledge of language (Apel et al., 2004). Wilson (2018) discusses the effects of social media on the students' ability of spelling in writing and states that it adversely affects the spelling in formal writing. In addition, Lee et al. (2019) discuss the influence of social media on the skills of students especially spelling. The studies show that social media greatly affect the writings of students especially spelling. However, Munir (2022) discuss that use of social media and SMS does not affect the standardization of English writing and spelling.

Wu and Juffs (2022) discuss that morphological errors are because of L1 transfer among the learners. Similarly, Masruddin and Nasriandi (2022) state that morphological and syntactic errors among L2 speakers are because of L1 transfer, and code switching causes these errors among ESL learners. In addition, Environment plays vital role in developing spelling competence in students. Digital learning environment plays crucial role in enhancing the spelling competence of ESL learners (Saban et al., 2024).Moreover, Omachonu (2025) discusses the influence of spelling errors on vocabulary acquisition and describes that there is co-relation between spelling competency and vocabulary acquisition. Nisa et al. (2023) state that Pakistani ESL learners face challenges in writings especially spelling errors occur due to adverse effects of social media usage like Facebook. Shahid et al. (2015) discuss the adverse effects of social media usage on the writings of ESL learners in Pakistan, and state that social media affect the writings of students in Pakistan. Furthermore, neuroscience research shows that word frequency modulates the neural recognition of spelling errors, with more frequent words triggering orthographic processing , whereas low-frequency words engage phonological strategies more heavily (Larionova & Martynova, 2022). This indicates that ESL learners familiarity with the input words plays vital role in spelling error detection and correction.

Optimality-Theory, originally developed for phonological analysis, offers a valuable framework for comprehension of competing constraints like faithfulness and markedness shape the output. Prince and Smolensky (2004) discuss that OT is useful framework that gives optimal candidate with minimal violations of lower ranked constraints rather than fatal violations. While applying OT to orthography remains very limited, its framework provides a systematic way to analyze why ESL learners in Pakistani English context prefer phonetically plausible but orthographically incorrect forms, especially where L1 influence the spelling of English language.

The above discussion shows that spelling errors in ESL context are multifaceted, emerging from pedagogical, sociocultural, cognitive, and linguistic sources. However, a gap remains in applying Optimality theory (OT) to systematically explain the patterns of spelling errors in ESL context in Pakistani English especially in essay writings. Bridging this gap is precisely the aim of the current study- to combine the error categorization with OT analysis to uncover the constraints underlying the common spelling errors in ESL learners' writing in Pakistan.

Research Methodology

The current study is mainly qualitative and descriptive to investigate the nature and patterns of spelling errors in English essay writings of Pakistani ESL students enrolled in BS English programs at university level, using the theoretical framework of Optimality Theory (OT) for analysis of the problem. The study included 40 undergraduate students from 04 public sector universities in Pakistan. The sample was selected using purposive sampling to ensure

representation from diverse academic background. Participants were instructed to write an essay of 300-400 words on any familiar topic under classroom conditions, without access to dictionaries or digital spell-check tools, to capture the authentic spelling performances. The collected essays were transcribed and each spelling error was identified, coded, and categorized into established error types as omission, substitution, transposition, insertion, and morphological errors. To enhance the credibility of the study, two trained raters identified and categorized the errors, with inter-rater agreement.

In the analysis phase, the identified errors were examined within the Optimality-Theory framework to determine the interaction of relevant constraints and ranking of the constraints influencing spelling of ESL learners in the output. Constraints were classified broadly into phonological, orthographical accuracy, and markedness reflecting the interplay between English orthography and L1 phonological structure. The errors were mapped into OT tableaux, showing how certain errors emerged as an optimal given the learners' internalized constraint hierarchies. Moreover, simple %age analysis of the errors was done to show the frequency of occurrences in the essay writings of the ESL learners. The methodological approach allowed for both a theoretically and methodologically sound explanation of the spelling errors.

Data Analysis

The data shows that Pakistani ESL learners make following errors in essay writings:

Substitution Error

Song et al. (2022) state that in the substitutional errors ESL learners substitute /i/ with /a/ in the output. The following constraints interact to show the substitution error in the output.

- ***ComplexV** – The constraint *CompV avoids the complex V(-ite) in the output.
- ***IrregGraph** – The constraint avoids grapheme-phoneme interaction in the output.
- **FAITH-IO (orth)**–Preserve the exact input-output correspondence.

Tableaux 1: Substitution error constraints in PE

/Definitely/	*ComplexV	*IrregGraph	FAITH-IO(orth)
a. definitely	*!	*!	
b. definitely			*
c. definatly		*!	*!

The constraint ranking will be:

*ComplexV>>*IrregGraph>>Faith-IO(orth)

The above tableau 1 shows that the input is 'definitely', which illustrates how markedness constraints influence the output spelling of the ESL learner in Pakistani context, which is '*definately', which is incorrect and shows that learners pronounce the word following the pronunciation of the word. The above table shows that the constraint *ComplexV penalizes complex vowel spellings such as the -ite sequence, while the constraint *IrregGraph disfavors irregular grapheme-phoneme correspondence in the output. The candidate (a) 'definitely' violates both markedness constraints despite being orthographically correct. The candidate (b) 'definitely'

satisfies the higher ranked constraints by simplifying the vowel sequence, but it violates the Faith-IO (orth) by altering the original spelling of the word. The data shows that the candidate (c) defenatly removes the irregular grapheme but introduces another irregularity, showing the violations of the constraints *IrregGraph and Faith-IO (orth) in the output. The above ranking shows that markedness constraints outranked the orthographic faithfulness constraints, so, the candidate (b) is emerged as optimal.

Omission Error

The studies show that ESL learners omit the segment in writing like Barbosa and Karla (2024) discuss the spelling errors, especially omission errors in young ESL learners. Moreover, Cando et al. (2024) discuss the spelling errors in the young learners of English and they discuss omission error. Overall, mission error in the writing of ESL learners occur due to the difference between orthographic and pronunciation of English words.

Constraints

- ***GeminateC** – The constraint avoid double consonants in the spelling.
- ***MorphMark** – The constraint avoids double or complex morphological marking on the output.
- **FAITH-IO(orth)** – The constraint preserves the input structure in the output.

Tableaux 2: Omission error constraints in PE

/occurred/	*GeminateC	*MorphMark	FAITH-IO(orth)
a. occurred	*!		
b. occured			*
c. ocured		*!	*!

The constraint ranking will be:

*GeminateC>>*MorphMark>>Faith-IO(orth)

The above tableau for the input word ‘occurred’ illustrates that the ESL learners in Pakistani English essay writings misspelled the word ‘occurred’ as ‘occured’ and it is optimal candidate under markedness-driven ranking in Pakistani English. The above tableau shows that the constraint *GeminateC penalizes doubled consonants, making the candidate (a) as non-optimal despite its orthographic correctness in the output. The tableau shows that the candidate (b) avoids the geminate consonants entirely, satisfying the higher ranked markedness constraints at the cost of lower ranked Faith-IO (orth) by omitting a letter ‘r’ in the word. The data shows that the candidate (c) violates *MorphMark by omitting a morphological marker, and breaching orthographic faithfulness constraints. The above tableau shows that markedness constraints outranked the faithfulness constraints, hence the candidate (b) is optimal.

Transposition Error

Lázaro et al. (2025) discuss the transposition error in the writing of young ESL learners. Moreover, Pongsukvajchakul (2022) discusses the spelling errors especially transposition errors in the English

writings of ESL learners and states that transposition errors occur in writings due to pronunciation and letter sound correspondence differences.

Constraints

- ***UncommonSeq** – The constraint avoids uncommon vowel correspondence in the sequence of the letters.
- ***PhonOrthMismatch** – The constraint avoids uncommon mismatch between the perceived vowel sound and orthographic spelling of the words.
- **FAITH-IO(orth)** – The constraint ensures the similarity between input and the output.

Tableaux 3: Transposition error constraints in PE

/priest/	*UncommonSeq	* PhonOrthMismatch	FAITH-IO(orth)
a. Preist	*!		
b. Priest			*
c. Prist		*!	*!

The constraint ranking will be:

* **UncommonSeq** >>* **PhonOrthMismatch** >>Faith-IO(orth)

The above tableau for the input word ‘priest’ demonstrates how the misspelling of the word ‘priest’ becomes *preist’ in the essay writings of the ESL learners at the undergraduate level in Pakistani English due to the interaction of markedness constraints. The constraint *UncommonSeq penalizes the less marked vowel sequence ‘ie’ in this phonological context, making the candidate (a) non-optimal despite its orthographical shape resemblance with the input. The above data shows that the candidate (b) replaces the sequence ‘ie’ with ‘ei’ and becomes choice of students because this sequence is more common in English language, and students prefer it. The candidate (b) satisfies markedness constraints but violates faith-IO (orth) by altering the original grapheme order. The candidate (c) prist is non-optimal because it reduces the entire cluster and violates *PhonOrthMismatch by producing spelling that diverges from the perceived vowel sound. Hence, the candidate (b) is optimal as it outranks the orthographic faithfulness.

Phonetic Spelling Error

In the writings of ESL learners in Pakistani English, spelling errors occur due the unpronounced segment present in the orthographic structure of the words. The following constraints are used to describe the error:

Constraints

- ***UnpronouncedSeg** – The constraints avoids the segments that are not pronounced in the output
- ***ComplexCluster** – The constraint avoids the complex consonant clusters in the output.
- **FAITH-IO(orth)** – The constraint preserve the input structure in the output.

Tableaux 4: Unpronounced segment error constraints in PE

/government/	*unpronouncedSeq	*ComplexC	FAITH-IO(orth)
a. government	*!	*!	
b. goverment			*
c. govement			*!

The constraint ranking will be:

* **UnpronouncedSeq** >>***COMPLEXC** >>Faith-IO(orth)

THE above tableau for the word 'government' shows a phonetic spelling error driven by markedness constraint of *unpronouncedseg, which penalizes writing letters that are weak or often omitted in speech e.g., in the word 'government' /n/ is elided, and * complex penalizes the consonant cluster created by retaining the segment /n/ in the word 'government'. The above tableau illustrates that the candidate (a) violates both markedness constraints despite being correct orthography. Candidate (b) deletes the segment /n/, thereby it satisfies the constraint *unpronouncedSeg and avoids the cluster, but violates the lower ranked constraint Faith-IO (orth) for deletion. Candidate (c) removes additional segments producing a candidate which has fatal violations and it avoids higher rnaked constraints. Thus, the candidate *unpronouncedSeg, *ComplexC outranked the Faith_IO(orth).

Homophone Confusion Spelling Error

Neils (1995) suggests that homophone confusions are caused due to the deficiency in semantic access to the functional output of the lexicon in speakers. Moreover, Tsai et al., (2011) state that handwriting impairments and pronunciation competence cause homophone confusion spelling errors. The following constraints are used to describe the homophone confusion spelling errors:

Constraints

- ***SemanticDistAmb** – The constraint *SemanticDistAmb avoids the orthographic distinctions that do not change pronunciation.
- ***LowFreqForm** – The constraint *LowFreqForm avoids the less frequent forms.
- **FAITH-IO(orth)** – The constraint preserves the input structure in the output.

Tableaux 5: Homophone Confusion error constraints in PE

/ðɛər/ (possessive)	*SemDistAmb	*LowFreForm	FAITH-IO(orth)
a. **/ðiər/**	*!	*!	
b. **/ðɛər/**			*
c. **/ðɛr/**		*!	*!

The constraint ranking will be:

* **SemDistAmb** >>***LowFreForm** >>Faith-IO(orth)

The above constraints ranking shows that the word /ðɛər/ models a classic homophone confusion in the ESL learners in Pakistani English essay writings. The constraint *SemDistAmb penalizes relying on the orthographic distinctions that are not audible e.g., their & there, and the constraint *LowFreForm disfavours the less familiar form for many learners in Pakistani English. The data

shows that the candidate (a) is orthographically correct but violates the higher ranked markedness constraints. The candidate (b) there satisfies markedness constraints by choosing a familiar form and avoiding an inaudible distinction, but it violates Faith-IO (orth0 by not matching the intended spelling. The candidate (c) thare is non-existent form violating both LowFreForm and Faith-IO (orth) constraints.

Letter Omission Spelling Errors

Lailiyah et al. (2020) discuss the spelling errors in ESL learners of Indonesian speakers and state that these errors are caused due to the orthographical structure of the words, mostly occur in the words having double letters.

Constraints

- ***GeminateCons** – The constraint avoids repeated consonant in spelling.
- ***OrthComplexity** – The constraint avoids complex structure.
- **FAITH-IO(orth)** – It preserves the input structure in the output.

Tableaux 6: Letter Omission error constraints in PE

Accommodation	*GemC	*OrthComplexity	FAITH-IO(orth)
a. **Accommodation**	*!	*!	
b. **Acommodation**			*
c. **Acomodation**		*!	*!

The constraint ranking will be:

* **GemC**>>***OrthComplexity** >>Faith-IO(orth)

The above tableau shows that the word ‘accomodation’ captures a letter-omission error driven by markedness *GemC , which penalizes doubled C and * OrthComplexity, which penalizes visually dense spellings of the word. The candidate (b) is optimal because it satisfies markedness constraint but violates Faith-IO (orth). The candidate (c) omits ‘second /m/’ and violates *GemC and Faith-IO (orth).

Morphologically Complex Form Spelling Error

Issa (2022) discusses morphological complex form spelling errors in Arabic and states that these errors occur due to the prefixes and suffixes attached with the words. In ESL context affixation affects the spelling as learners of L2 have less understandings of affixation process in English. The following constraints are used to tackle with the morphologically complex form spelling errors:

Constraints

- ***MorphComplex** – The constraint avoids morphologically complex forms that require combining of multiple morpheme in English.
- ***IrregMorphSpell** – The constraint avoids irregular morphological spellings that do not follow a simple phoneme and grapheme correspondence.
- **FAITH-IO(orth)** – It preserves the structure of the input.

Tableaux 7: Morphologically complex form error constraints in PE

Unnecessarily	*MorphComplex	*IrregMorphSpell	FAITH-IO(orth)
a. Unnecessarily	*!	*!	
b. Unnecessarily			*
c. Unnessarily		*!	*!

The constraint ranking will be:

*__MorphComplex__>>*__IrregMorphSpell__ >>Faith-IO(orth)

The above tableau for the word 'unnecesarily' shows a morphologically complex spelling error influenced by the markedness constraint, *MorphComplex, which penalizes morphologically complex structures that combine multiple morphemes with spelling changes, and the constraint *IrregMorphSpell penalizes irregular morphological spellings like 'ecess' in the correct form of the word. The candidate (a) violates both markedness constraints. The candidate (b) replaces more irregular sequence with regular sequence '_ess' and satisfies the higher ranked constraints at the cost of low-ranked constraint Faith-IO (Orth). The candidate (c) reduces the word by omitting a whole syllable and becomes non-optimal.

Conclusion

The analysis of the spelling errors through the lens of Optimality Theory shows that most of the spelling errors in ESL context in Pakistani English essay writings of learners result from the dominance of the markedness constraints over orthographic faithfulness in the learners grammar of lexicon. The study highlights that in Pakistani English essay writings spelling errors are phonetic, substitution, homophone confusion, letter omissions and morphological errors because of students intention to ease the spelling, use familiar structures and avoid irregular spellings and clusters of standard English. Moreover, data shows that Pakistani ESL learners commit mistakes in spellings of words because of the difference in the pronunciation of words and orthographic structures of the words. The Optimality analysis shows that constraints like *GEMC, *ComplexV outranked Faith-IO (orth) leading to simplified vowel sequences and these constraints often avoid complex or double consonants in spellings. Moreover, data shows that the constraints *SemanticDistAMb and *LowFreqFormaccounted for frequent homophone substitutions, illustrating that the Pakistani ESL learners prefer high frequency, semantically ambiguous forms that match their spoken representations. The data analysis shows that in Pakistani ESL learners' essay wriitngs morphological errors are influenced by *MorphComplex and *IrregMorphSpell , and these constraints depict that learners simplify the irregular morphemes spellings to align these structures with the more common phoneme-grapheme correspondences in writings. The findings of the study indicate that in ESL context spelling errors are systematic outs of the constraints interactions, not random mistakes, and the instructional inventions and variations should be aimed to raise the ranking of orthographic faithfulness by instructing the correct sequence sof morpheme-phoneme sequences, irregular spelling patterns of English, and morphological rules in ESL teaching context in the classrooms. In addition, the study examined the nature and patterns of spelling errors in English essay writings of Pakistani students enrolled at BS level study, which can be expanded to other English learning contexts in Pakistan and utilized to analyze other writing errors through the lens of Optimality Theory.

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