

## Phonological processes in the non-native phonology of Akan

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### Abstract

This paper seeks to investigate the phonological processes embedded in the phonology of native Ewe speakers of Akan. This study has become necessary because Akan is a lingua franca in Ghana where most people have some level of speaking and comprehension competence. However, at the early production or pre-advanced phase of L<sub>2</sub> acquisition, the Ewe speakers of Akan encounter numerous segmental and prosodic challenges which trigger various phonological processes as resolution strategies. Therefore, this study bridges this gap in language acquisition by examining the phonological processes entrenched in the phonology of Ewe speakers acquiring Akan as their L<sub>2</sub>. The challenges usually arise from phonological dissimilarities between the L<sub>1</sub> source phonology and the L<sub>2</sub> target. The paper argues that the inadequacies in L<sub>2</sub> acquisition at the pre-advanced phase trigger some phonological processes such as vowel raising and lowering, anteriorization, and de-stridentization among others as phonological simplification strategies to resolve challenging native Akan forms. The study employs focus group discussion as a data collection approach and it is formalized within the Perceptual Assimilation Model of second language learning (PAM- L<sub>2</sub>) (cf. Best 1993; Best & Tyler 2007).

**Keywords:** Phonological processes, non-native speakers, Akan, simplification, Assimilation

### Abstract in Akan (Twi)

Saa dwumadie yi ye nhwehwemu a efa fonologyi nhyehyeee ahodoɔ a eɔa adi wɔ Ewefoɔ a afei na wɔresua Akan se L<sub>2</sub> aka wɔn Ewe a eye L<sub>1</sub> no ho. Saa adesua yi ho abehia efiri se Akan ye kasa titire a ɔmanfoɔ tumi sua ka wɔn kasa ho ka no se L<sub>2</sub> anaa kasa a etɔ so mmieniu wɔ Ghana. Yei nti Ewefoɔ a wɔka Ewe kasa no se L<sub>1</sub> nanso wɔresua Akan no se L<sub>2</sub> no, eye a wɔhyia ɔhaw ahodoɔ pii wɔ Akan nnyegyeee ne selaboro nhyehyeee no mu bi ne titire bere a wɔn ano nkokwaa wɔ Akan ho. Yei ama wɔfa fonologyi nhyehyeee ahodoɔ bi so de sɔ saa ɔhaw no ano senea ebeye a wɔbetumi abɔ nnyegyeee anaa asemfua bi wɔ ne ka mu yie. Nhwehwemu dwumadie yi si ɔhaw a eɔa adi wɔ kasasua mu no ano se ebɛhwɛwe fonologyi nhyehyeee ahodoɔ a Ewefoɔ a afei na wɔresua Akan no fa so de sɔ saa ɔhaw no ano. Mpen pii no, nea eɔe saa ɔhaw yi ba ye nnyegyeee a wɔnye pe anaa wɔnni Ewe L<sub>1</sub> ne Akan L<sub>2</sub> no mu. Nhwehwemu yi da no adi

se fɔnɔlɔgi nhyehyee a Ewefɔ no fa so de sɔ ɔhaw no ano bi ne; baworo sorokɔ ne baworo famba, antiriaye, anto-nkyeremuyɛ ne dodoɔ a ekeka ho. Yenam dɔm a yeboaboa wɔn ano akuokuo so na yenyaa nsem de dii dwuma yi. Yɛde yen nkyerekyeremu no nyina gyinaa Perceptual Assimilation Model (PAM) adwenmusem a ɔfa L<sub>2</sub> no nsuae no so.

## **Introduction**

Second Language acquisition can be described as the process of learning to speak, comprehend and use a second language (L<sub>2</sub>) in addition to the mother tongue or the first language (L<sub>1</sub>). Despite its description as a second language, it refers to the process of learning to speak and use any other language after the first language whether it is the second, third, or fourth language (Haynes, 2007). Thus, aside from the first language, any other language acquired and spoken by an individual could be described as a second language (L<sub>2</sub>). In this light, the study looks into the phonology of non-native speakers of Akan particularly native Ewe speakers acquiring Akan as an L<sub>2</sub>. The acquisition of Akan could be for the reasons of socialization, commercialization, education, or any other socio-economic motivation. For these reasons, the learning setting for this speech community is usually informal.

In the literature on L<sub>2</sub> acquisition, it is worthy of note that most studies have been on the acquisition procedures and the various theories underlining the acquisition for academic purposes and in a formal setting. Such studies include Krashen & Terrel (1983), Brown (2002), and Haynes (2007) among others which focus on the development of English and other Indo-European Languages as L<sub>2</sub>. However, the present study dwells on the acquisition of Akan as L<sub>2</sub> by the aforementioned non-native speakers with special reference to the phonological interruption from their L<sub>1</sub>. The study looks into the phonology of these non-native Akan speakers to identify the various simplification strategies employed to overcome challenging units in Akan. The challenge usually has its origin in a relatively segmental shortfall in the non-native speakers' L<sub>1</sub> or late mastery of some L<sub>2</sub> phonological competencies. This causes the predominant inaccuracies and misarticulations that characterize L<sub>2</sub> development and the non-native speakers' phonology. Against this backdrop, Fromkin (1973) opines that a speech error is evidence of a phonological process in action.

Thus, from the phonological level of mastery, Haynes (2007) establishes five (5) phases in language acquisition: preproduction, early production, speech emergence, intermediate fluency, and advanced fluency in that order of mastery. Except for the phase of advanced fluency, the phonology of L<sub>2</sub> speakers within the other phases is rich in phonological processes due to the countless inadequacies, especially in the early production and speech emergence phase. Even among fluent L<sub>2</sub> speakers, some of these processes are occasioned as articulatory accidents, especially in rapid speech. Thus, it is obvious from

studies on L<sub>2</sub> acquisition that irrespective of the typological similarities and dissimilarities between an L<sub>1</sub> and the target language (L<sub>2</sub>), non-native speakers encounter phonological challenges and inadequacies in the course of acquiring an L<sub>2</sub> and Akan is not an exception. Also, as part of the consensus, it is noted that the acquisition process is not haphazard but follows a certain natural order with few exceptions (cf. Tabors, 2008; Helgundseth, 2009). For instance, in segmental phonology, it is observed that rather than building a novel set of sound inventory for the L<sub>2</sub>, the non-native speaker taps into the L<sub>1</sub> segmental stock in pronouncing morphs and morphemes of the L<sub>2</sub> (So & Dodd 1995, p. 7).

The same transfer of L<sub>1</sub> phonological competencies can be said of the phonotactic acquisition, syllable development, and other prosodic features in the L<sub>2</sub>. Thus, the acquisition ability commences from a transfer of L<sub>1</sub> competencies in acquiring the L<sub>2</sub>. These phonological competencies develop from the more familiar and less challenging units to the less familiar and more challenging units. In this regard, any segment or unit present in the L<sub>2</sub> yet absent in the L<sub>1</sub> of the speaker stimulates a peculiar phonological challenge for the non-native speaker (Tabors, 2008). This challenge is mostly responsible for the imprecision and inaccuracies surrounding the early phases of L<sub>2</sub> acquisition. Following the constraint as a result of an unfamiliar unit in the L<sub>2</sub>, the non-native speaker's phonology adopts various repair strategies to augment their shortfall in the pronunciation of morphs and morphemes featuring the unattained or imprecise segment(s) at a particular period. The repair as a form of simplification strategy on the challenging unit for the non-native speaker sparks various phonological processes.

The simplification strategy could be realized as a replacement, deletion, or assimilatory process. Therefore, this paper discusses various phonological processes in the category of substitution and assimilation processes as manifested in the data gathered. On substitution, we discuss the processes of vowel raising and lowering, anteriorization, plosivisation and de-stridentization as constituting the L<sub>2</sub> segmental phonology. Issues relating to the details of L<sub>2</sub> prosody are outside the scope of this study.

In this regard, after the preliminary information in Section 1, the rest of the paper is organized as follows. Section 2 presents brief background information on Akan and Ewe as well as their segment inventory. Section 3 deals with the methodology employed for this study. Section 4 presents the data and analyses to show the various phonological processes embedded in the phonology of Ewe speakers acquiring Akan. Section 5 formalizes the discussion on the Perceptual Assimilation Model of second language learning and section 6 concludes with a summary of the discussion.

## Akan segmental inventory

Akan has nine contrastive oral vowels /i, ɪ, e, ɛ, u, ʊ, o, ɔ, a/, one allophonic oral vowel [æ] and five contrastive nasal vowels /ĩ, ɪ̃, ã, õ, ẽ/ (cf. Odoom & Adomako 2021; Dolphyne 2006; Schachter & Fromkin 1968, among others). The allophonic vowel [æ] is in complementary distribution with /a/. While [æ] occurs before advanced high vowels (Twi-Asante and Akuapem), after advanced high vowels (Gomua Mfantse), /a/ occurs elsewhere (Odoom & Adomako, 2021; Adomako, 2015; Dolphyne, 2006). The Table below classifies the said vowels in terms of binary features.

**Table 1: Feature matrix of Akan vowels**

Vowels	/i/	/ɪ/	/e/	/ɛ/	/æ/	/a/	/ɔ/	/o/	/ʊ/	/u/	/ĩ/	/ɪ̃/	/ã/	/õ/	/ẽ/
High	+	+	-	-	-	-	-	-	+	+	+	+	-	+	+
Back	-	-	-	-	-	-	+	+	+	+	-	-	-	+	+
Low	-	-	-	-	+	+	-	-	-	-	-	-	+	-	-
ATR	+	-	+	-	+	-	-	+	-	+	+	-	-	-	+
Nasal	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+

It is quite interesting to observe that all vowels, except [æ] which is allophonic, particularly /i, ɪ, ɔ, e, ɛ, u, ʊ, o, a/ are phonemic and when replaced with a different vowel, alter the pronunciation and meaning.

At the consonantal level, Akan has fourteen (14) systematic consonant phonemes, namely / p, b, t, d, k, g, m, n, r, f, s, h, j, w / (cf. Abakah 2012, 2005). These consonants are systematic because they are the primary conventional sounds that have a single articulatory point. Aside, there are other phonemic consonants having a dual articulatory point. They are labial cum palatal synchronously. These consonants include /tɕ, dɕ, ɛɕ, ɲɕ, ɸ/. This is because their production is accomplished by raising the body of the tongue toward the palate while approximating the lips. Aside from these secondary consonants, there are other phonetic consonants such as / d̥, t̥, ɛ̥, tɕ̥, dɕ̥, ɲ̥, ɸ̥ / that are derived through assimilatory processes. For instance, / ɛ̥, t̥, d̥, d̥, t̥ / are derived when /h, k, g, d, t/ occur before a front vowel respectively as demonstrated in (1) below.

1. a. /hrw/ → [ɛɪw] ‘burn’
- b. /akɪm/ → [ateĩm] ‘ethnic group in Eastern Ghana’
- c. /kibi/ → [teebʲi] ‘a town in Eastern Ghana’
- d. /gina/ → [d͡z̥ĩnã] ‘to remain/stand’
- e. /tɛw/ → [tsew] (Fante) ‘to plant/to nurse’
- f. /di/ → [dzi] (Fante) ‘eat’
- g. /kɔ/ → [ŋkʷɔ] ‘do not go’
- h. /bɔa/ → [mbʷɔa] ‘help’
- i. /mframa/ → [m̩frãmã] ‘air’
- j. /nkɪm/ → [nteĩm] (Fante)/[nteĩm̩] (Twi) ‘salt’

It is obvious that the said consonants are derived through an assimilatory process such as coronalisation (a-d), affricativisation or stridentisation (e-f), dorsalisation (g), labialisation (h), labial-dentalisation/labialisation (i), palatalization/coronalization (j) (cf. Abakah, 2012; Adomako, 2018; Odoom & Adomako, 2022).

**Table 2: Consonants inventory of Akan**

	Bilabial	Labio-dental	Alveolar	Alveo-palatal	Palatal	Labial-alveopalatal	Velar	Labial-velar	Glottal
Stop	p, b		t, d				k, g		
Affricates			t͡s, d͡z	t͡ɕ, d͡ʒ		t͡ɕ̥, d͡ʒ̥			
Fricatives		f	s	ɕ		ɕ̥			h
Nasals	m	m̩	n		ɲ	ɲ̥	ŋ		
Approximants			r		j	ɥ		w	

(Source: Own processing)

### Background of Ewe and its phonemic inventory

Ewe is a member of a cluster of languages known as the Gbe language family. The language geographically covers the Volta River in Ghana to Western Nigeria in Badagry as its spoken lands. However, Ewe is predominantly spoken in parts of Ghana and Togo. In Ghana, it is in the Volta Region that Ewe is commonly spoken as a lingua franca. The Ewe language is made up of vocalic as well as consonantal phonemes. It has eight (8) oral vowels with [ə] in contention; three front vowels /i, e, ɛ/, three back vowels /u, o, ɔ/ and two central vowels /ə, a/ (cf. Capo, 1991; Duthie, 1996). Except [e, o], the oral

vowels have their nasal counterparts. Ewe and Akan vocalic inventories have similarities as well as dissimilarities. To establish this relationship Table (3) below highlights the one-to-one vowel mapping in the two languages.

**Table 3: Akan and Ewe vowel mapping**

<b>Akan</b>	i	ɪ	u	ʊ	e	ɛ	o	ɔ	æ	a	
<b>Ewe</b>	i		u		e	ɛ	o	ɔ		a	ə

As demonstrated in the table, it is obvious that three Akan vowels, namely /ɪ/, /ʊ/, and /æ/ are absent in the Ewe vocalic system. This challenges the phonology of a native Ewe speaker acquiring speaking competencies in Akan as L<sub>2</sub>. Aside from this, according to Capo (1991) and Dutchie (1996), Ewe has a rich consonantal inventory. However, irrespective of the rich inventory, some of the consonants are foreign to Akan while other segments in Akan are also not present in Ewe. Table (4) below shows the Ewe consonantal inventory adopted from Dutchie (1996).

**Table 4: Ewe consonant chart**

	Bilabial	Labiodental	Alveolar	Retroflex	Palatal	velar	labio- velar	Glottal
Plosives	p b		t d	ɖ		k, g	kɸ, gɸ	
Fricatives	ɸ β	f v	s z			x ɣ		h
Affricates			tʃ dʒ					
Nasals	m				ɲ	ŋ		
Lateral			l					
Trill			r					
Semi-vowels	w				j			

(Source: Dutchie, 1996, 12)

The chart shows that Ewe has more phonemic consonants than Akan. However, there are a few consonants in Akan that are absent in the Ewe inventory. This observation is tabulated below.

**Table 5: Akan vs. Ewe consonant mapping**

Akan	ɲ	t͡s̄	d͡z̄	ɲ̄	ɛ	t͡ɛ̄	ɛ̄	d͡z̄̄	tɛ	d͡z
Ewe	ɲ	t͡s̄	d͡z̄							

The table shows that while the Akan palatal nasal /ɲ/ and the two other affricates, [t͡s, d͡z], have a direct correspondence in the Ewe inventory, the other labial nasal, alveo-palatals and; /ɲ̄, ɛ, t͡ɛ̄, ɛ̄, d͡z̄̄, tɛ, d͡z/ have no direct equivalent matrices in the Ewe phonemic inventory. This relative segmental vacuum in Ewe constrains the acquisition and fluency of the native Ewe speaker acquiring Akan phonology as L<sub>2</sub>, especially at the early phase. Ewe is endowed with only two affricates /t͡s̄, d͡z̄/ and a palatal nasal /ɲ/ whereas Akan has six affricates /t͡s̄, d͡z̄, t͡ɛ̄, d͡z̄̄, tɛ, d͡z/, a labial nasal /ɲ̄/, alveo-palatal fricatives and affricate; /ɛ, tɛ, d͡z/ and the labial-alveopalatal /ɛ̄̄, t͡ɛ̄̄, d͡z̄̄̄/ which have no direct correspondence in Ewe inventory. How does the Ewe speaker acquiring Akan as L<sub>2</sub> at the early phase of language development make up the differences in the segmental inventory? Hence, the focus of this paper is to investigate how the Ewe speaker acquiring Akan as L<sub>2</sub> simplifies Akan morphemes containing these alveopalatals and labial-alveopalatals, especially at the pre-advanced phase of L<sub>2</sub> acquisition.

### Data Collection and Methodology

The paper is based on a selection of about fifty (50) Akan lexical items. These words were made up of varieties of phonetic and prosodic shapes carefully selected with the background phonology of the L<sub>2</sub> speakers in mind. Twenty-five of these words were extracted from Christaller's (1933) "Dictionary of the Asante and Fante Language" and the remaining twenty-five were from direct primary or oral sources. Those from direct oral sources were gathered from the first-year language students of Akan (Fante and Twi) at the Ajumako campus of the University of Education, Winneba. Most of these words explicitly feature a segment, structure, or phonological constraint absent in the L<sub>1</sub> of the selected non-native Akan speakers. The data were checked with our focus group respondents comprising the first-year native Ewe speakers at the early production phase of acquiring Akan as their L<sub>2</sub> through a social learning programme known as '*Language Proficiency Studies*'. These respondents were purposively sampled as non-native speakers of Akan at the pre-advanced stage.

To elicit the phonology of how the challenging segments and prosodic units are treated in this phonological community, we conducted three (3) Focus Group Discussions (FGD) with the native and non-native speakers of Akan at the early phase of language development. One out of the three groups consisted of seven (7) first-year students of Ewe. The other group of seven comprised native speakers of Ewe with little formal

education. For certainty, two groups out of the three (FGD) respondents were native speakers of Ewe and were at the early production phase of socially acquiring Akan as their L<sub>2</sub>. The third group was made up of native first-year Akan students. Groups 1 and 2 were the early L<sub>2</sub> speakers and Group 3 was the native Akan speakers. In ensuring confidentiality and anonymity for respondents, we employed pseudonyms whereby each participant was assigned numbers as a label. For instance, G1P1 refers to Participant 1 in Group 1. The others in this Ewe group were (G1P1, G1P2, G1P3, G1P4, G1P5, G1P6, and G1P7), and (G2P1, G2P2.....) whereas the Akan group carried the label (G3P1...) in that order. Groups 1 and 2 were the purposively sampled L<sub>2</sub> speakers who have an underdeveloped Akan phonology due to their limited contact with the Akan language.

The third group as a control measure consisted of native Akan speakers. The respondents in each group consisted of three males and four females aged eighteen and above. The participants in Group 2 were people with little or no formal education. All respondents were consciously engaged in casual conversations in Akan. Alongside, pictures and other stimuli were used to solicit respondents' phonology and pronunciations of the selected 50 lexical words of Akan. The respondents were stimulated to repeat the pronunciation in slow speech in order to emphasize and confirm the quality of the repair strategy employed to pronounce such words. These informal dialogues were recorded with a voice recorder. Two other independent transcribers transcribed the extracted data to enhance the consistency and accuracy of the groupings.

In the course of this exercise, twenty-five (25) primary source data were extracted from the recordings as the primary data for this study. The twenty-five (25) extracted primary source data were subsequently transcribed and categorized into the various phonological processes for this study. Prior, it was clearly emphasized to the participants that the study was purely an academic exercise but not for ridicule nor driven by any ethnic sentiments. This point was clarified to all the twenty-one in order not to be misconstrued in any way.

## **Theoretical Framework**

This study focuses on the Perceptual Assimilation Model of second language acquisition (PAM-L2). The similarity between the segmental inventories of a person's first language (L1) and second language (L2) plays a crucial role in the acquisition and perception of L2 phonology. Many L2 acquisition models are created based on the inter-language phonological similarities to explain L2 phonological development. One such model is the Native Language Magnet (NLM) by Kuhl (1993), which uses similarity as an attractive magnetic force to create a gravitational pull from memory. Another model, the Speech Learning Model (SLM) by Flege (1995), relies on similarity to produce equivalent classifications. The Perceptual Assimilation Model of second language learning (PAM-



L2) by Best (1993, 1994) and Best & Tyler (2007) develops feature similarity for assimilations.

The methodology utilized in this study, along with the propositions suggested in PAM-L2, are well-suited to explain the development of Akan phonology among native Ewe speakers during the early stages of learning Akan as a second language. This is appropriate as PAM-L2 postulates encompass adult L2 phonological development, starting with the naïve perceiver and a non-native contrast that has never been heard before. PAM-L2 also suggests that articulatory gestures are directly perceived, and phonological categories are formed through perceptual learning via perceptual attunement. The perceiver tunes into the abstract perceptual unit that defines a category. This perceptual attunement, combined with raw auditory information and L1 transfers, influences the perceiver's productions, particularly during the early stages of L2 learning. With PAM-L2, learners are presumed to assimilate phonological categories from the target language into a common interlanguage phonological system. PAM-L2 also states that learners may maintain common L1 and L2 phonological categories in a way that is similar to how allophones of a phoneme correspond to a single phonological category (cf. Antoniou et al., 2012).

When non-native speakers attempt to learn a new language (L2), they may encounter difficulty with certain sounds that clash with their native language (L1). The Perceptual Assimilation Model (PAM) for L2 phonological development explains how the brain processes these sounds. In PAM, non-native sounds may be categorized or uncategorized and can be assimilated (made similar) to corresponding sounds in the L1. The degree to which this occurs determines the success of the learner's development in L2 phonology.

PAM identifies different patterns of assimilation, based on how the brain perceives the sounds. In the Single Category (SC) pattern, two L2 sounds are assimilated to a single L1 category, making them difficult to differentiate. In the Two Category (TC) pattern, two L2 sounds are assimilated into two different L1 categories, making them easier to differentiate. In the Category Goodness (CG) pattern, one L2 sound assimilates better to the L1 category than the other, making differentiation more or less difficult depending on the degree of difference. In the Uncategorized-Categorized (UC) pattern, one L2 sound is uncategorized while the other is categorized, making it easier to differentiate. In the Uncategorized-Uncategorized (UU) pattern, both L2 sounds are uncategorized, making differentiation difficult based solely on their similarity.

As one receives more exposure to L2 input, the brain undergoes a reorganization of assimilation patterns and separates itself from native transfer categories. This results in a speech that is more similar to that of a native speaker. These ideas, presented by PAM-L2, align with certain aspects of articulatory phonology and apply to the phonology of a native Ewe speaker during the initial stages of acquiring Akan phonology as an L2.

## Data Analysis and Presentation

In this section, we will explore the different ways that non-native speakers who are learning Akan as their second language simplify their phonology at the pre-advanced stage.

### Vowel raising in L<sub>2</sub> phonology of native Ewe speakers

In Akan morphophonology, vowel raising is a prominent concept, particularly in reduplication (as noted by Raimy, 2000). As previously mentioned, Ewe lacks the high front lax vowel /ɪ/. Consequently, any Akan word with this sound is altered to the high front tense vowel /i/, as demonstrated below.

2.	Native Form	Ewe Form	Gloss
a.	kɛsɪ	kɛsi	'big'
b.	kɪkã	kika	'to say severally'
c.	tɪbɪa	tibia	'form/nature'
d.	kɪtɪkɪtɪ	kitikiti	'very small'
e.	sɪkan	sikan	'cutlass'
f.	atɔkɔ	atuku	'millet'
g.	bɔrɔfɔ	burɔfu	'English'
h.	bɔsɔmɪ	busumi	'month'
i.	paanɔɔ	paanuu	'bread'
j.	ntɔntɔm	ntuntum	'mosquitoes'

From the above data, it is observed that the [-ATR] high vowels; /ɪ/ and /ʊ/ in the native form are raised to their [+ATR] counterparts /i/ and /u/ in the non-native form, respectively. The replacement of the vowels is without cognizance of the ATR specification of the adjacent vowels and is not arbitrary too, but phonologically driven. The commencement of the process is from the point that the [-ATR, +High] vowels /ɪ/ and /ʊ/ are absent in the vocalic inventory of Ewe. That is, the phonological foundation of the L<sub>2</sub> speaker is deprived of the vowels /ɪ/ and /ʊ/ featured in the above Akan morphemes. However, these challenging lexical items are supposed to be redressed by the native Ewe speaker who is acquiring Akan as a second language. Therefore, the L<sub>2</sub> unadvanced high; /ɪ/ and /ʊ/ are raised to advanced high /i/ and /u/ present in the L<sub>1</sub> phonology. This is on account that the replacing vowel is the highest front and back

vowel in both the L<sub>1</sub> and the L<sub>2</sub> phonology (cf. Abakah, 2002; Capo, 1991; Dutchie, 1996).

Aside from the rise in height in the vowel space, the replacement further leads to an alternation of the ATR specification. Its auditory effect is an accent and a phonetic representation in L<sub>2</sub> phonology that deviates from the native speakers' phonology. The rising pattern is phonologically tenable on account that the raised vowel /i/ and the unraised vowel /ɪ/ are both [+Coronal] and the raised vowel /u/ and its unraised vowel /ʊ/ are also [+Labial] on the unified feature specification. Hence, based on the shared specification of coronality and labiality as well as [+high], /ɪ/ is replaceable with /i/ and /ʊ/ is also replaceable with /u/, respectively. Dzameshie (1996) and Wornyo (2016) report a similar vowel substitution where /i/ replaces /ɪ/ and /u/ replaces /ʊ/ in English loanword nativisation in Ewe. However, despite the fact that the majority of the non-native speakers attested to the vowel raising, two (2) participants; G1P5, and G2P4 virtually preserved the [-ATR] high front vowel. These respondents maintained the same [-ATR] high front vowel as the native Akan speakers. Further background scrutiny revealed that these respondents were either raised in Akan lands or had prolonged language contact with native Akan speakers yet their communication is mostly in Ewe, especially at home.

### **Vowel Lowering in L<sub>2</sub> Phonology of Native Ewe Speakers**

Aside from vowel raising, vowel lowering is also attested in L<sub>2</sub> phonology as a result of the vocalic gap and unfamiliarity between the L<sub>1</sub> source and the L<sub>2</sub> target. Vowel lowering is part of the movement in the vowel system that involves a shift in vowel values from a relatively higher phonological space to a lower height configuration in the course of pronunciation or articulation (cf. Harrington, 2012). The process centres on vowels and their incongruity based on height in the vertical space. Vowel lowering could be realized as a phonological variation within the same language system or substitution of a higher vowel for a comparatively lower counterpart in a clash of two phonologies. The lowering process could be induced by several linguistic factors from sociolinguistic to phonological underpinnings (Tabors, 2008). Unlike vowel raising, vowel lowering is not a very common natural process in Akan. It is rather attested to the phonology of native Ewe speakers acquiring Akan as their L<sub>2</sub>. In this regard, the lowering is a result of a replacement of a relatively higher vowel for the lowest version in the native phonology. This replacement is a mitigation strategy for the non-native speaker due to the absence of the higher vowel version in the L<sub>1</sub> phonology as illustrated below.

3.	<b>Native Form</b>	<b>Non-native Form</b>	<b>Gloss</b>
a.	æduro	aduro	‘medicine’

b.	bææbi	baabi	‘somewhere’
c.	ænim	anim	‘front’
d.	æni	ani	‘eyes’
e.	mæko	mako	‘pepper’
f.	pætuo	patuo	‘owl’
g.	æpoo	apoo	‘extortion’
h.	k <sup>w</sup> æsi	k <sup>w</sup> uasi	‘Sunday male born’

It is obvious from the data above that the advanced low vowel /æ/ in the native form is realised in the L<sub>2</sub> phonology as /a/. This shows a replacement pattern of /æ/ for the lowest counterpart /a/ either at the word-initial or medial position in the L<sub>2</sub> phonology. The frequency and the pattern of replacement in the pronunciation indicate that the replacement is not ordinary or random but induced by the vowel constraint in the L<sub>1</sub> phonology of the speaker. That is, the [+Low, +ATR] vowel /æ/ is unavailable in the vocalic inventory of Ewe phonology. In effect, the L<sub>2</sub> phonology retrospectively maps acoustic signals from Akan onto the feature matrices of their native phonology (L<sub>1</sub>) to find correspondent segments for all other segments except the absent vowel /æ/. Therefore, in the interim, the L<sub>2</sub> phonology is compelled to mitigate this constraint by replacing the absent segment -/æ/- with its proximal equivalent /a/ from the L<sub>1</sub> into L<sub>2</sub> phonology. Consequently, the [+Low, +ATR] vowel /æ/ in the native form is further lowered in the vowel space to its [-ATR] counterpart /a/ vowel in L<sub>2</sub> phonology. The replacement does not just lower the height in the vowel space but also alters the ATR values. Thus, in the auditory sense, it is the difference in vowel lowering and ATR values in the replacing vowel that underscores the oddness in the phonetic rendition in L<sub>2</sub> phonology as shown in the data above.

This lowering is the inverse of the phenomenon above. Nevertheless, the two respondents who deviated from the pattern of vowel raising also deviated from the lowering as well. One other respondent; G1P7 exhibited signs of deviation. A retrospective interrogation of this other respondent unveiled that this non-native speaker is a child of an Akan-Ewe inter-ethnic marriage and for that reason not very alienated from the native Akan phonology. This reinforces the point that with respect to vowel lowering and raising, there are few exemptions among native Ewe speakers acquiring Akan as an L2 at the pre-advanced phase. This precedence is usual for linguistic data, especially in language acquisition.

Four participants, one from each group G1P1, G1P2, G1P3, G1P4, who are acquiring Akan at the pre-advanced stage do not lower the [+ATR] low vowel, [æ]. We asked them the reason and two said:

My mother is an Ewe and my father is a Fante. We often speak Fante and English at home and sometimes my mum speaks Ewe with me. When I go to school too, we study Fante, so I am more of speaking Fante than Ewe, though I can speak the Ewe language too.

Both my mother and father speak Ewe but we stayed at Koforidua. The landlord is a Fante man and he and his family speak Fante. We study Akuapem Twi in school too. So as for me, I can speak Ewe, Twi, and Fante fluently without any mistakes.

It is quite true that not all Ewe speakers who are acquiring Akan at the pre-advanced stage lower the [+ATR] low vowel.

As indicated, the Akan vowel inventory shares some crucial similarities with the Ewe vowel system. Therefore, in consonance with PAM- L<sub>2</sub> postulations, the L<sub>2</sub> learner maintains the common Akan (L<sub>2</sub>) vowels through perceptual attunement. That is, the native Ewe speaker acquiring Akan's L<sub>2</sub> perceives some Akan vowel stimuli as identical and the same as some Ewe L<sub>1</sub> vowels. Therefore, in responding to these vowel stimuli and in early speech production, the L<sub>2</sub> learner tunes in to the perceived and transfers from the L<sub>1</sub> source. This identical perceptual attunement affects target vowels of Akan and Ewe such as / i, e, ε, o, u, ɔ, a / which have direct articulatory gesture correspondence in the L<sub>1</sub>. Therefore, these vowels are rightly discriminated by the L<sub>2</sub> learner or perceived as identical to the L<sub>1</sub> source vowel and they require no further assimilation.

However, for most pre-advanced speakers, the vowel; /ɪ/, /ʊ/, and /æ/ are unfamiliar vowel gestures to the native Ewe speaker acquiring Akan as an L<sub>2</sub>. This unfamiliarity is due to their absence from the Ewe source phonology. Thus, according to PAM-L<sub>2</sub>, the onus lies on the L<sub>1</sub> source (Ewe) phonology to judge these sound stimuli as either assimilable or non-assimilable (cf. Best & Tyler, 2007). Consequently, on grounds of some feature consistency with the L<sub>1</sub> source, the Ewe speaker judges these unfamiliar units as not completely unknown but as assimilable vowel gestures. The vowels - /ɪ/, /ʊ/, and /æ/ are partly consistent with some L<sub>1</sub> vowel articulatory gestures yet the difference is contrastive in the L<sub>2</sub>. The assimilation is to deal with the absence and the contrast between the L<sub>2</sub> target vowels; /ɪ/, /ʊ/, and /æ/. However, the L<sub>2</sub> learner's perceptual assimilation is driven by feature proximity of /ɪ/, /ʊ/, and /æ/ to the existing L<sub>1</sub> source vowels; / i, e, ε, o, u, ɔ, a /. As evident in data (1) and (2) above, the articulatory similarity and acoustic proximity influence the L<sub>2</sub> vowel; /ɪ/ to map onto the L<sub>1</sub> source /i/ in Ewe while /æ/ assimilates to L<sub>1</sub> /a/ and /ʊ/ assimilates to /u/. The discrimination for assimilation is accurate since Akan /ɪ/ and Ewe /i/ are both [+ coronal] while /ʊ/ and /u/ are both [+ Dorsal] and /æ/ and /a/ are neutral on the unified feature specification.

In the proposal of PAM- L<sub>2</sub>, this pattern of assimilation parallels the two-category assimilation pattern that predicts excellence discrimination. That is, the unfamiliar vowel stimuli are eventually well discriminated and two non-native phonemes are not perceived as one L<sub>1</sub> category. This excellence discrimination underscores the perceiver’s degree of success and the learnability of the L<sub>2</sub> as projected by PAM- L<sub>2</sub>.

Nevertheless, the remaining contrast between the L<sub>2</sub> target vowel /i/ assimilated and replaced with the L<sub>1</sub> source /i/ is the rise in height and the alteration in the ATR values. The contrast of vowel raising is part of the oddity and imprecision from the natural Akan phonology that native Akan speakers perceive in the phonology of the native Ewe speaker acquiring Akan as an L<sub>2</sub>. Conversely, the oddity between L<sub>2</sub> /æ/ assimilated to L<sub>1</sub> /a/ is that of vowel lowering. However, according to PAM- L<sub>2</sub>, the exposure to extra L<sub>2</sub> (i.e., Akan) inputs over time addresses the oddity in the phonology of the L<sub>2</sub> speaker towards proficiency (cf. Best, 1995; Best & Tyler, 2007). Thus, in line with this PAM assertion, it is not outrageous that participants G1P5, G1P7 and G2P4 have a level of background orientation to Akan phonology manifested a deviation from the pattern of vowel raising and lowering.

#### **De-palatalisation through Anteriorisation in L<sub>2</sub> phonology of an Ewe speaker**

Anteriorization as a phonological process refers to the circumstance whereby a post-alveolar sound such as a velar, palatal, or posterior sound is replaced with a segment that is made toward the front of the vocal tract (cf. Williamson, 2010; Abakah, 2012). In this view, the pre-palatal region that comprises the alveolar, labio-dental, and bilabial domains of the vocal tract constitutes the frontage of the tract. Consequently, anteriorization of a posterior or a [+Back] sound is evident among the Ewe speakers acquiring Akan as their L<sub>2</sub>. The process is not accidental but phonologically informed. It is mostly a resolution strategy adopted in L<sub>2</sub> phonology to deal with posterior segments that are acquired late in language development (cf. Chan & Li, 2000; Ingram, 2008; Amoako, 2020). It is a linguistic universal simplification phenomenon that is popular in L<sub>2</sub> phonology due to the absence or difficulty in the production of posteriors as compared to anteriors. The following data drawn from the phonology of Ewe speakers acquiring phonological competencies in Akan at the pre-advanced phase illustrates this process of anteriorization.

4.	Native Form	Non-native Form	Gloss
a.	teɪtɛ	ts̩it̩ɛ	‘share’
b.	teate	ts̩ats̩a	‘gamble’
c.	abɔdz̩ɪ	abɔdz̩ui	‘bear’

d.	<b>dz</b> ina	<b>dz̄</b> ina	‘stand
e.	<b>dz</b> imi	<b>dz̄</b> imi	‘foolishness’
f.	<b>ɲŋ</b> ɔnɔ	nunu	‘cold’

It is observed from the data above that the posterior segments [tɛ, dz̄ɥ, dz̄, ɲŋ] in the native form are replaced with an approximate anterior segment in the non-native L<sub>2</sub> phonology. The posteriority in the segments [tɛ, dz̄ɥ, dz̄, ɲŋ] stems from the fact that their point of articulation is located partly beyond the alveolar region but within the palatal domains of the oral cavity (cf. Abakah, 2012). However, the replacing segments [t̄s, d̄z̄, n] are relatively the anterior realisations of the posteriors in the native forms. From the above data, the pattern of the replacement is such that the anteriors [t̄s, d̄z̄, n] conveniently replace [tɛ, dz̄ɥ, dz̄, ɲŋ], respectively. But [d̄z̄] doubles as a replacement for Akan affricates [dz̄ɥ, dz̄] in example (c-e). This replacement in L<sub>2</sub> phonology is systematic and phonologically inspired. According to Silverman (1992), in L<sub>2</sub> learning, acoustic signals from the target language (L<sub>2</sub>) are mapped onto the feature matrices of the learners’ native phonological system. Similarly, the phonological drive in this very context is on account that the phonology of the L<sub>2</sub> speaker maps on the feature matrix in the Akan native forms unto their L<sub>1</sub> segmental phonology.

The mapping is in search of feature correspondents in L<sub>1</sub> that are acoustically identical to the oncoming Akan native forms. However, the feature matrix mapping is between Ewe phonology and Akan. The mapping is flawed with a constraint as there is no true correspondent in the L<sub>1</sub> that shares the same articulatory and acoustic specification as the Akan posteriors, [tɛ, dz̄ɥ, dz̄, ɲŋ]. Moreover, the palatal and the velar regions attain a late readiness in language learning (cf. Ingram 2008; Amoako 2020). Therefore, in response to these constraints, the phonology of the L<sub>2</sub> speaker is forced to approximate for convenience. Consequently, the alveolar /n/ replaces [ɲŋ] in example (f) based on [+Nasal] resemblance and shared feature. Also, on grounds of stridentality and perceptual resemblance, [t̄s] replaces [tɛ] in examples (a-b) and [d̄z̄] replaces [dz̄ɥ] in examples (c-e) and the same [dz̄] for Akan [dz̄ɥ]-examples (d&e). As usual in second language development, a few of the participants exhibited a deviation from the pattern of anteriorization to near-native forms. Nonetheless, such marginal irregularity is not very significant to override the extensive anteriorization among the respondents.

### Partial de-stridentization in L<sub>2</sub> phonology

Partial de-stridentization as a phonological process is also prevalent among Ewe speakers acquiring Akan as L<sub>2</sub> at the pre-advanced phase. This process is both perceptually and articulatorily driven. Though similar to anteriorization, partial de-stridentization specifically addresses challenging affricates as well as fricatives and their related factors

as a manner of articulation while anteriorization is a mitigation for lately developed posteriors. According to Ingram (2008) and Amoako (2020), affricates as an articulatory manner and posteriors as an articulatory place constitute part of the lately acquired abilities in language learning. Akan alveopalatal stridents comprise [ɛ̠, ɛ̠ɥ̠, tɛ̠, tɛ̠ɥ̠, dʒ̠, dʒ̠ɥ̠]. On top of that, Ewe inventory as the background phonology of the L<sub>2</sub> speaker is relatively constrained with only two affricates, namely [dʒ̠, tʃ̠]. Therefore, the Ewe speaker acquiring Akan as L<sub>2</sub> resorts to partial de-stridentization as one of the mitigation strategies to make up the difference, especially at the early stage of Akan acquisition as shown below.

<b>5. Native Form</b>	<b>Non-native form</b>	<b>Gloss</b>
a. maɛ̠ɥ̠ asi	mafi asi	‘I have fallen down’
b. aɛ̠ɥ̠ɛ̠ɥ̠	aɛ̠ɥ̠	‘mirror’
c. ɛ̠ɥ̠ɛ̠ɥ̠im	aɛ̠ɥ̠im	‘grab repetitively’
d. ɛ̠ɥ̠iam	ɛ̠ɥ̠iam	‘meeting’
e. ɛ̠ɥ̠ɛ̠ɥ̠	ɛ̠ɥ̠ɛ̠ɥ̠	‘glamorous’
f. sika	sika	‘money’

Comparing the native forms in data (5) above to their corresponding realizations in L<sub>2</sub> phonology shows some segmental dissimilarities. The difference originates from the view that all the native forms from (5a-e) have an alveopalatal strident as part of its constituent either at the word-initial or medial position. These alveopalatal stridents identified as [ɛ̠ɥ̠, ɛ̠] are usually replaced with plain strident /f, s/ in the L<sub>2</sub> phonology. The replacement of [ɛ̠ɥ̠, ɛ̠] with /f, s/, respectively as demonstrated above is not ordinary nor accidental but has a phonological underpinning. The speaker matches the Akan input segments in the L<sub>2</sub> against the L<sub>1</sub> segmental inventory.

On the failure to identify a direct correspondent for /ɛ̠ɥ̠, ɛ̠/ in the L<sub>1</sub>, the speaker resorts to segmental approximation to partly conform to the acoustic specification of the input segments. Aside from the absence, the sophistication in the alveopalatal strident [ɛ̠ɥ̠, ɛ̠] also causes an articulatory challenge for the under-developed L<sub>2</sub> phonology. In response, the L<sub>2</sub> phonology is compelled to simplify by opting for a plain strident such as /f/ for [ɛ̠ɥ̠] and /s/ for /ɛ̠/. This is a result of the inability of the under-developed L<sub>2</sub> phonology of the speaker to draw the tongue back to the alveopalatal location while involving the lips concurrently. The tongue surges forward instead, thus de-palatalizing the palatality in the L<sub>2</sub> input segment [ɛ̠ɥ̠, ɛ̠] and reducing the friction turbulence. Akan fricative /s/ in example (f) is non-palatalised and therefore not affected by the de-palatalization. Its features are retained in the L<sub>2</sub> phonology.



## De-affrication through plosivisation in L<sub>2</sub> phonology

De-affrication refers to the process that deals with the simplification of challenging and less familiar affricates. The resolution of the challenging affricate is usually realised as a substitution of the unfamiliar segment for a familiar plosive or fricative counterpart with some shared similarities. The challenge could be borne out of the late development of that segmental competence due to the sophistication involved or the absence of the said segment, especially in the case of L<sub>2</sub> development. Likewise, as indicated above, affricates in Akan inventory exceed that of Ewe. However, de-affrication as attested in the phonology of native Ewe speakers acquiring Akan affects the affricate [tɛ̃ɸ, dz̃ɸ] but [k<sup>w</sup>] is rather de-labialized while its plosivity is maintained. Accordingly, de-affrication itself occurs as a replacement of the challenging affricate for familiar labialized plosives as shown below.

6.	Native Form	Non-native Form	Gloss
	a. tɛ̃ɸi	t <sup>w</sup> ui	‘language’
	b. atɛ̃ɸidɛ	at <sup>w</sup> uidɛ	‘ladder’
	d. ædz̃ɸumã	ad <sup>w</sup> umã	‘work’
	e. adz̃ɸinĩ	ad <sup>w</sup> uini	‘mind’
	h. k <sup>w</sup> æti	k <sup>w</sup> uati	‘avoid’
	i. ŋk <sup>w</sup> ɪ	ŋk <sup>w</sup> uɪ	‘disease’
	j. ak <sup>w</sup> æsi	ak <sup>w</sup> uasi	‘name’

From the data above, it is noticeable that the affricates [tɛ̃ɸ, dz̃ɸ] in the native form pose a challenge to the non-native Akan speaker, especially at the early stages of L<sub>2</sub> development. This is partly due to the absence of direct correspondence in the L<sub>1</sub> and the sophistication involved in the seemingly co-articulation process. In a resolution of the challenge, their simpler plosives /t, d/ replace /tɛ̃ɸ, dz̃ɸ/, respectively while the perceptual labiality is resolved with the epenthetic insertion of the default high vowel /u/ and its resultant labialization. The mitigation strategy results in de-affrication of Akan /tɛ̃ɸ, dz̃ɸ/ because instead of a continuation of the articulation process from the intermediary /t, d/ to have the affrication feature, the process rather truncates abruptly at the plosive point. Hence, the labialized plosivisation of the target affricates /tɛ̃ɸ, dz̃ɸ/ in L<sub>2</sub> phonology is due to the segmental constraint in the source phonology.

## Native Ewe Speakers' Assimilation of Akan Consonants in PAM- L<sub>2</sub>

In PAM-L<sub>2</sub>, the vowel assimilation pattern displays a two-category (TC) assimilation pattern, which shows excellent discrimination. However, the assimilation of some unfamiliar Akan consonants is different. Both the Akan labial alveopalatal [ɖz̠] and non-labial alveopalatal [ɖz̠] are contrastive but non-existent in the L<sub>1</sub> source Ewe phonology. As a result, they undergo assimilation in the L<sub>2</sub> phonology, but the assimilation product undermines the contrastiveness of these target L<sub>2</sub> phones. Instead of perceiving each phone as distinct and mapping it onto separate L<sub>1</sub> phones, the L<sub>2</sub> phonology fails to perceive that contrast. The discrimination challenge becomes more complicated when more contrastive L<sub>2</sub> phones are involved but assimilated into fewer L<sub>1</sub> categories.

According to PAM-L<sub>2</sub> assertions, when two different L<sub>2</sub> sounds are combined into one L<sub>1</sub> sound, it is called the single category (SC) assimilation pattern. PAM-L<sub>2</sub> predicts that distinguishing between these sounds will be challenging. This prediction is correct, as shown in the assimilation of [ɖz̠] and [ɖz̠] into [d̠z̠] in (4c-e). This makes it difficult to differentiate between the L<sub>2</sub> sounds, which can negatively impact learning L<sub>2</sub> phonemes and phonology. PAM-L<sub>2</sub> suggests that further exposure to L<sub>2</sub> inputs will eventually resolve the discrimination challenge and lead to natural phonological proficiency. However, in the meantime, Ewe speakers learning Akan as an L<sub>2</sub> may simplify their speech by substituting both Akan sounds [ɖz̠] and [ɖz̠] with the L<sub>1</sub> sound [d̠z̠], as shown in data (4) above. This results in an (SC) assimilation pattern where two different L<sub>2</sub> sounds are combined into one L<sub>1</sub> sound. Over time, the difference in backness that makes the L<sub>2</sub> speaker's phonology unnatural will be resolved.

Moreover, the category goodness (CG) assimilation pattern is also evident in the phonology of native Ewe speakers acquiring Akan as L<sub>2</sub>. In the CG assimilation pattern, one member of the L<sub>2</sub> contrasts is assimilated as a good version and the other as a poor version of a native category. In this instance, perceptual discrimination difficulty depends on the degree of difference in category goodness between the two L<sub>2</sub> phones. This (CG) pattern can describe the assimilation of Akan contrastive phones; [ɛ] and /s/ to the L<sub>1</sub> native category, /s/ in data (5d-f). That is, the two Akan L<sub>2</sub> sounds involved are contrastive but are both perceived and assimilated to native /s/ in Ewe. However, in this (CG) assimilation pattern, it stands to reason that, out of the two assimilating L<sub>2</sub> contrastive Akan phones, the alveolar /s/ is perceived as a good version and direct equivalent for the L<sub>1</sub> category /s/ that both L<sub>2</sub> phones assimilate to. In other words, the palatalised L<sub>2</sub> segment; /ɛ/ is a poor version of L<sub>1</sub> /s/ due to its palatal difference.

According to PAM-L<sub>2</sub>, the discrimination difficulty is dependent on the contrast between the two L<sub>2</sub> phones. In this case, the palatality distinction between /ɛ/ and /s/ highlights the

difficulty in discrimination. Therefore, discrimination difficulty can be said to range from minimal to moderate as both [ɛ] and /s/ are [+ sibilant]. On this count, the interim simplification process is a partial de-stridentization as exemplified in data (5) above. It is however noteworthy that, over time the difference in the assimilation can be resolved through exposure to more L<sub>2</sub> inputs.

## Conclusion

This study aimed to identify the phonological processes in L2 phonology by examining the segmental inventory of Akan and Ewe. The researchers found that Akan has some segments that are not present in Ewe's inventory, such as the vowels /ɪ, ʊ, æ/. As a result, native Ewe speakers learning Akan as their L2 perceive these vowels as foreign and struggle to express morphemes in Akan that require these absent vowels. To overcome this challenge, Ewe speakers match acoustic signals from these vowels onto their L1 phonology's feature matrices in search of phonetic approximations. Consequently, the Ewe speaker's phonology replaces Akan's /ɪ/ with /i/ and /ʊ/ with /u/ based on their shared [+High] feature, resulting in vowel raising. Similarly, the Akan source vowel /æ/ is replaced with /a/ due to their identical [+Low] and centrality feature, resulting in vowel lowering. Concerning consonants, Akan's posterior segments [tɛ̃, dʒɛ̃, tɛ, dʒ, ɛ, ɛ̃, ɲɛ̃] are replaced by [tʃ, dʒ] in the non-native form. Native Ewe speakers acquiring Akan as their L2 partially de-palatalize and de-stridentize the [+Sibilant] component in Akan's segments [ɛ̃, ɛ], replacing them with /f, s/, respectively. The affricates [tɛ̃, dʒɛ̃] in Akan undergo plosivisation in L2 phonology, as they are late to develop that competence. The Perceptual Assimilation Model of second language learning showed that segmental similarities between L1 and L2 are central in the replacement pattern of phonological processes. Poor discrimination and contrast in the replacement pattern reflect the unnaturalness in L2 phonology relative to native Akan forms.

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