Implementing orthography[*]

Alex Trueman, Louise St. Amour, and Heidi Harley[◻]
University of Arizona

Abstract: Creating an orthographic system is a huge and daunting task; however even working with a previously established orthography comes with its own set of challenges. Our project involves developing materials for learners of the Uto-Aztecan language Hiaki (also written variously as Yaqui, Jiaki, Yoeme). Here we outline some of the challenges and choices we have faced in implementing the established orthographic system in a consistent and useful way while dealing sensitively with the interests of a) learners of the language, and b) existing communities of speakers. We focus on three primary areas: the tension between underlying and surface representations with regard to vowel length and pitch accent placement, dialect differences and sound changes, and cliticization and the representation of word boundaries. Throughout the relationship between learner needs and providing a complete and accurate representation for the community is highlighted.

Keywords: revitalization, pedagogy, Yaqui, pitch accent, vowel length, cliticization

1   Introduction / project details

1.1   Hiaki language

Hiaki is a Uto-Aztecan language of the Tara-Cahitic subfamily, spoken in Sonora, Mexico, and in Tucson, Arizona. The name of the language is written variously as Yaqui, Jiaki, or Yoeme. The form *Hiaki* conforms to the orthography sanctioned by Arizona's Pascua Yaqui Tribe Language Policy (1984). Although there are ~3000 speakers in Sonora, the number of first language speakers is dwindling. The situation in Arizona is considerably more dire. The Arizona dialect of Hiaki is moribund; its 40–50 remaining fluent speakers are all fifty years of age or (mostly) older, and it is not being acquired by children as a first language. In this context, formal second language instruction is a critical tool for maintaining linguistic knowledge in the community.

1.2   Pedagogical grammar project

Our project, which began in 2009, is a pedagogical grammar, intended for use outside the academy. The grammar is intended as a supplement to, or component of, a complete language-teaching curriculum, not as a complete language textbook, and has a restricted range of focus,

namely grammatical features of the language. It does not include conversational, situational or cultural instruction. Because it is intended for a non-linguist audience, it provides definitions and discussion of the meanings of necessary grammatical concepts, and minimizes the use of technical terms as much as possible.

The need for the book to serve multiple audiences and purposes is a major factor in our planning and approach. For the non-linguist heritage speaker/learner, we attempt to provide introduction to grammatical concepts, with clear and non-technical descriptions of the grammatical properties of Hiaki. We attempt to make it complete enough that language teachers may use it as a reference resource, and we attempt to provide sufficiently accurate linguistic analysis to satisfy the needs of language workers and linguists.

The project, with funding from the NSF/ARRA, began in 2009 with the first volume of the grammar, and the second volume went into development in 2015. The short, 3–4 page lessons are designed to complement the goals of the holistic and culturally rich language instruction efforts of the tribe. Each lesson is made up of three sections: 1) a Vocabulary list of 5–15 words; 2) the lesson itself, with example sentences; 3) two or more basic exercises designed to help the student practice the pattern introduced in each lesson. Each lesson also contains at least one call-out text box highlighting a difficult concept or reminding students of a concept from a previous lesson. The first and (partially drafted) second volumes each contain an introduction, a glossary, and 32 lessons. The 32 lessons are divided into four units, consisting of two sections of four lessons each.

In the context of a language course, the book is intended to provide a brief weekly or biweekly opportunity to focus on a single grammatical pattern, as one component of a complete curriculum. Its self-contained design, however, also means that interested learners working on their own in small communities away from Tucson can learn the basics of Hiaki grammatical structure.

1.3 Consultants

The language data is provided by two of the coauthors, elders Maria Fernandez Leyva and Santos Leyva. Mrs. Leyva is a speaker of Arizona Hiaki, born in Tucson. She has done community language work in one form or another for most of her adult life, including several years as director of the Pascua Yaqui Tribe Language and Culture Department. She is trilingual in English, Spanish and (Arizona) Hiaki. Mr. Leyva is a speaker of Sonoran Hiaki, born in Potam Pueblo in the Hiaki territory. He is bilingual in Spanish and Hiaki, and has lived in the United States for approximately a decade. The grammar team, including Mrs. and Mr. Leyva, meet once a week to discuss lessons, go over examples and exercises, and learn more about grammatical patterns. Mrs. Leyva provides the final approval of each lesson and the content, form and spelling of language examples, and most of the community input in discussions about orthographic representations.

2 Contexts and concerns

2.1 Impact/scope

Our group's concerns about our orthographic choices in this project are heightened by fact that we are producing an explicitly pedagogical resource for a language which has relatively few such resources available. This may make our decisions potentially more impactful in the long term than might usually be the case. That is, since there are a relatively small number of resources

available for the Hiaki language, any published work could have a relatively disproportionate impact, particularly if it is directed at general audience (since so many extant Hiaki resources are academic). Additionally, many of the available resources use the Sonoran orthography rather than that established by the Pascua Yaqui tribe in Arizona. Pedagogical resources, which are even rarer, may also have a larger impact on future speaker/spellers precisely because they are intended to be an explicit guide to language use.

Some of the previous work with related aims upon which we draw, and which might also be used by learners, include Hiaki-English and Hiaki-Spanish dictionaries (Molina et al. 1999 and Fernandez et al. 2004), and an extensive compendium of Hiaki grammatical structures (Dedrick and Casad 1999), which contains a wealth of empirical data, and the Yaqui Language Workbook of Jelinek et al. (1998), which is a direct ancestor of this project.[1] Of these only the Molina et al. dictionary and Jelinek et. al Workbook, however, use the Arizona Hiaki spelling system that we are employing.

2.2 Arizona Hiaki language policies/history/issues

Arizona Hiaki has an established orthography, which was given official sanction in the Pascua Yaqui Tribe Language Policy in 1984. The Policy supports the use of the Hiaki language at all levels of education, and clarifies tribal authority in regard to all policies related to language, whether connected to school curricula, teacher training, writing and orthography, outside research, publication and reproduction of cultural materials, and funding to support language development. (Trujillo 1991) The policy declaration begins thus:

> The Yaqui Language is a gift from *Itom Achai*, the Creator, to our people and, therefore, shall be treated with respect. Our ancient language is the foundation of our cultural and spiritual heritage without which we could not exist in the manner that our Creator intended. Education is the transmission of culture and values, therefore, we declare that Yaqui education shall be the means for the transmission of the Yaqui language and spiritual and cultural heritage. We further declare that all aspects of the educational process shall reflect the beauty of our Yaqui language, culture and values. (Council P.Y.T 1984)

It is of paramount importance to respect this clear policy statement as fully as possible as we create new materials in the language. However, the devil is in the details: In specific cases, which choices will most truly 'reflect the beauty of the Hiaki language'?

---

[1] In the more academic realm, there are several English-language dissertations which focus on the language (Lindenfield 1973, Escalante 1990a, Guerrero 2005, Martinez Fabian 2006, Trueman 2015, as well as the dissertation of Hagberg 1993 on the phonology of the closely related language Mayo). There are also a few theses in Spanish from the Universidad de Sonora, e.g. Castro Llamas 1988. Finally, several papers on aspects of the language have appeared in conference procedings, volumes and journals, including, e.g., Escalante 1990b, Jelinek and Escalante 1988, Jelinek 1997, Demers, Escalante and Jelinek 1999, Guerrero and van Valin 2004, Guerrero 2005, Felix Armendáriz 2005, Martinez Fabian and Langendoen 1996, Haugen, Harley and Tubino-Blanco 2008, Harley, Tubino-Blanco and Haugen 2014, Trueman and Harley 2010, Tubino-Blanco and Harley 2013, Harley 2014, among others.

2.3 Concerns

The issues which complicate our task are many. One, perhaps expected, complication relates to dialectal variation among the various Arizona speaker communities, such as Pascua and Guadalupe. The issues surrounding language variation, identity and prestige are many and complex. For example, the word meaning 'big' is pronounced variously as *bwe'u* and *voa*. If we choose to represent primarily one dialect, we implicitly elevate it with respect to others, and risk alienating communities that use other varieties. Speakers of other varieties may perceive the examples presented in the grammar as inauthentic. On the other hand, including multiple forms, pronunciations and spellings is likely to be confusing to learners as well as a presentational challenge (Dorian 1994, Tulloch 2006).

We have concluded that for the most part, particular lexical and pronunciation variants need to be chosen for the benefit of the learner audience. We need, however, to balance the interests of the other intended audiences as well, and these interests often come into conflict. So, for example, the desire to lean towards simple forms and explanations which are more accessible for learners can come into conflict with the desire to provide a complete and insightful grammatical representation for the benefit of community language workers. The common formula for thanking, *chiokoe uttesia*, is a reduced form of *Enchi hiokoe uttesia*, literally '(I) really forgive you'. The choice concerning whether or not to spell the accusative second person pronoun *enchi* as a separate word exemplifies a tension between mirroring perceptual experience of this formula and representing its internal meaningful structure. The choices we make in this and similar cases reflect a prioritization of the needs of one of our many intended and potential audiences. We are trying to strike the correct balance.

Finally, an important complicating factor has to do with the incomplete understanding of Hiaki in the technical literature. There are many corners of the grammar that descriptions do not touch, or are insufficiently detailed to provide authoritative answers that could guide presentational choices. One area that has a particularly significant impact on orthography concerns vowel length variation. Certain words' vowels are sometimes long and sometimes short, but the conditioning environment for this effect, as well as the issue of whether it should always be orthographically represented, has not been addressed in previous work. Similarly, Hiaki words have a pitch accent whose placement is partially lexically determined but varies depending on certain derivational processes, which variation is not precisely characterized in previous literature. To make matters even more challenging, pitch accent and vowel length interact in poorly understood ways.

We now turn to a more complete articulation of specific orthographic challenges we have faced and the rationales for our proposed responses to them.

3 Established orthographic variation

The orthographic conventions established by the Hiaki communities in the US differ in several ways from the orthography utilized by the Sonoran communities. Much of this variation can be attributed to influence from the English and Spanish systems respectively, since these are the major contact languages in each region.

3.1 Arizona Hiaki and Sonoran Jiaki representational differences

The tables below show the orthographic representations of Hiaki phonemes in the Arizonan and Sonoran traditions.

Table 1 Consonant Representations

	IPA	Arizona	Sonora
Stops	/p/, /t/ /k/, /ʔ/	p, t, k, '	p, t, {k, c}, '
	/bʷ/	bw	{bw, bu}
Nasals	/n/, /m/	n, m	n, m
Affricate	/ʧ/	ch	ch
Fricatives	/s/, /β/, /h/	s, v, h	s, b, j
Liquids	/l/, /r/	l, r	l, r
Glides	/j/, /w/	y, w	y, {w, g(o)}

Borrowed words with /d/ usually render it /l/; 'Lios' < 'Dios', e.g.

Table 2 Vowel Representations

	IPA	Arizona	Sonora
Front	/i/, /e/	i, e	i, e
	/i:/, /e:/	ii, ee	ii, ee
Central	/a/	a	a
	/a:/	aa	aa
Back	/u/, /o/	u, o	u, o
	/u:/, /o:/	uu, oo	uu, oo

All VV sequences occur and are disyllabic except when V2 is 'i', 'u' in which case V2 represents the corresponding glide

The differences shown here are not extensive; vowels differ not at all, and only a handful of consonants are represented differently. Of the two orthographies, the Arizona variant is actually somewhat more consistent, with a clear one-to-one relationship between phoneme and grapheme.

The written examples below show the same sentence presented in each of the Sonoran and Arizonan orthographies.

(1) **Sonoran Jiaki orthography**

Wikosata	ne	baajtak	in	ousi	jibwaka	betchi'ibo
belt.ACC	1SG.NOM	loosened	1PL.GEN	much	eat.PPL	COMP.RATIONALE

'I loosened my belt due to my eating a lot.'   (Fernandez et al 2004:56)

(2) **Arizona Hiaki orthography**

Wikosata	ne	vaahtak	in	ousi	hi'ibwaka	vetchi'ivo
belt.ACC	1SG.NOM	loosened	1PL.GEN	much	eat.PPL	COMP.RATIONALE

'I loosened my belt due to my eating a lot.'

3.2   Variation within Arizona Hiaki

The Arizona Hiaki orthography generally operates at a fairly 'surface' level of representation, that is, it tends to present words as they are pronounced rather than representing underlying morphosyntactic forms. Thus, for example, (morpho)phonological changes are usually spelled out. One such change is an affective alternation between /l/ and /r/. Hence the word 'green' can

258

be either *sikili,* indicating a pleasant shade of green, or *sikiri*, which indicates a sickly or unpleasant shade.

Other sound changes may be optionally spelled out, such as /s/ → /h/ / ___ C, exemplified in (3) and vowel shortening before suffixation, shown in (4).

(3) Waka**s**-ta waka**h**-ta 'cow-ACC'

(4) bw**ii**ka bw**i**k-ne 'sing-FUT'

Some sound changes are typically *not* represented orthographically. One example is onset /h/ insertion (or possibly /h/ drop) on the determiner *uu/uka*, 'the.NOM/the.ACC'. Here, both variants occur, but both are typically spelled 'uu'; the spelling 'huu' is not used.

(5) /uu/ /huu/ 'the'

In sum, although the orthographic system is in general fundamentally 'surface-oriented', that orientation has limits; there are cases where spelling of an optional surface form is optional, as in the /s/~/h/ alternation, and cases where spelling of an optional surface form is forbidden, as in the /uu/~/huu/ alternation. Where we discover previously undocumented optionality in spoken surface forms, a decision has to be made as to whether we enforce an invariant spelling corresponding to the most common form, or the underlying form, or whether we introduce spelling variation corresponding to the spoken variation. Both options seem to be potentially legitimate responses based on the precedents discussed in (3)–(5).

3.3   Our response

Our group has for the most part developed a set of strategies and guidelines to help us determine how best to implement the orthographic conventions of the language. In the general and most obvious case, our choices are driven by the established rules of the Arizona Hiaki orthography, such as the decision to spell the name of the language 'Hiaki', instead of 'Yaqui', or one of the other alternatives. We also use letters 'h' and 'v', for example, in place of 'j' and 'b', which are the Sonoran alternatives.

When established formal rules are not available, we next appeal to our consultants' preferences and intuitions. Thus, we choose to write *Lios enchi hiokoe*, rather than *Lios en chiokoe*, based on their intuition that the former conforms more closely to the 'correct' form of the greeting. Similarly, we accede to their preference in using the form *bwe'u* to mean 'big', rather than the variant *voa.*

However, even with these excellent sources of authority available to us, we still encounter a fairly high number of quandaries, when the available representational rules are either inconsistent, inadequate, or are subject to conflicting pressures. We discuss several specific examples of these kinds of puzzles in the next section.

4   Orthographic dilemmas and learner needs

Because written language exists as secondary to spoken language, it is easy to assume that orthographic representation is primarily useful in visual word recognition, but that orthographic information does not play a role in non-visual tasks such as auditory word recognition and speech production. Brewer (2007), however, has shown robust effects of orthography on speech production. In a language learning context where there is insufficient access to fluent spoken

input, potential orthographic effects on speech production may achieve a much greater level of significance.

4.1 Surface vs deep orthography

Orthographic representations of a given word are links to phonological, semantic, morphological and syntactic information about that word. An ideally informative orthography allows the learner to both reliably pronounce and interpret the material, however it is rarely possible to achieve this ideal due to complicating factors, such as sound changes that occur in particular morphosyntactic environments, for example. Most orthographies exist in a state of tension between surface representations, which allow for maximally accurate pronunciations, and deep representation, which strive to be maximally meaningfully and structurally transparent, allowing for reliable interpretation and decomposition, particularly of complex items (Share 2004).

Hiaki has agglutinative morphology and morpho-phonological sound changes. The sentence in (6) below provides an example of interaction between a morphosyntactic process – reduplication – and a morpho-phonological change, which highlights the tension between the surface and underlying forms.

(6) SR: Ume ili usim **atchachaka**
     UR: Ume   ili   uusi-m   **at-sa-saka**
           DET.PL little   child-PL   laugh-RED-go.PL.IMPF
           'The little children were running about laughing.'

The verb in (6) is a compound, composed of two independent verbs, *at-* 'laugh' and *-saka* 'go.pl'. Hiaki verbal reduplication is prefixal, but can target either member of a compound (Haugen and Harley 2013); in this example it targets the second element in the compound and thus appears to intervene between the verb stems.

Although [ʧ] is itself a phoneme of the language, here it represents the coalescence of [t] followed by [s] across a morpheme boundary. What is important to note is that the sound change apparently feeds the form of the reduplicant, resulting in the original root *saka* occuring in the form *chaka*, yet separated by a syllable (reduplicant *cha-*) from the conditioning environment that triggered the change.

One option, then, is to privilege a deep representation, maximizing interetability of the complex form, we would spell out the underlying form *atsasaka*. A learner faced with this spelling should be able to identify the verb stems, but would have some difficulty in coming up with the correct pronunciation, because while the first sound change, [ts] → [ʧ] might plausibly be learned as a rule, the pronunciation of the second [s] as [ʧ] remains utterly opaque, separated as it is from the conditioning environment.

The alternative, of course, is to spell the surface representation of the word, *atchachaka*. Now the learner has a very clear guide to the pronunciation, however the morphological structure is completely obscured and the learner is quite unlikely to be able to successfully extract the original root *saka*, in order to interpret the item correctly.

4.2 Complicating factors in representing vowel length

Another problematic case for us is the representation of vowel length. In Hiaki, long vowels in a stem may shorten under certain types of affixation, as shown in (7). Much less commonly, short vowels may occasionally lengthen in similar environments (8).

(7) **sii**me   → si-**si**me
       go.SG   RED-go.SG

(8) h**a**mut   → h**aa**much-im
       woman   woman-PL

In most cases, vowel length is represented as pronounced in Hiaki, and in general its pronunciation as long or short is usually grammatically deterministic, not optional, so it seems like this should be a non-issue. However it's far from as straightforward as it sounds, because the rules for precisely when a vowel must be long or short are not still fully understood. After some considerable investigation, we have established the following incomplete set of rules for when an underlying long vowel shortens:

- under all derivational affixation

- under some (but not all) inflectional affixation
    - syllabic suffixes trigger it mandatorily
    - consonantal suffixes seem to trigger it variably
        - position within the prosodic phrase, or prosodic emphasis, may play a role in non-mandatory shortening (Hagberg 1993)

So vowel length changes are in most cases obligatory, but in others optional, and may be influenced by discourse-level effects. For learners (and grammar writers) these kinds of uncertainties present a frustrating spelling and pronunciation puzzle with no reliable solution.

We continue, of course, to investigate the question, and certainly hope to find a more complete answer, although it will likely never be a simple one.

Unfortunately, the difficulties with representing vowel length still do not end there. In addition to the cases of apparent optionality in length, there is a recoverability issue for learners with certain forms. Vowel length is generally described as phonemic in Hiaki, because we are able to point to minimal pairs, such as those in (8), where vowel length is lexically distinctive.

(9) **Short vowel**   **Long vowel**
      amu (grandchild; feminine)   *aamu* (hunt)
      vika (arrowhead)   *viika* (rot)
      kova (head)   *koova* (win)

However, the existence of morpho-phonologically triggered vowel shortening means that lexical distinctions such as these become orthographically (as well as phonologically) obscured by the adherence to surface level representation. For example a form like *kova-ka* could either mean 'having a head' (*kova+ka*) or 'winning' (*koova+ka* + vowel shortening). Again, although this would not be problematic for an experienced speaker in context, for a learner, such homophony/homography could prove difficult.

Continuing our anxieties over vowel length, we turn to the problem of functional items. Hiaki has several functional items which consist only of a vowel, such as the determiners *uu* and *ii*. Although they are almost always written with a long vowel, they are commonly pronounced as short vowels. Further complicating the issue with some of these items is homophony and corresponding homography. For example, *a* or *aa* may represent a possibility modal adverb or a 3rd person singular accusative clitic pronoun. The question is, should we aim to represent

(variable) pronunciation accurately? Or should we take advantage of the potential for a slightly deeper orthographic representation to disambiguate homophonous items?

4.3   Intermittent representation

4.3.1   Pitch accent

Features such as vowel length distinctions and the [t] → [ʧ] sound change have correlates in English orthographic choices, and as such are potentially relatable to orthographic issues our target audience has faced in their first language. Other features which occur in Hiaki, such as pitch accent, have no such parallel in English.

Pitch accent is typically not represented orthographically, except in certain cases where it distinguishes minimal or near minimal lexeme pairs.

(10) *anía* 'help'   *ánia* 'world'

(11) *have* 'someone'   *havée* 'who'

'Regular' pitch accent occurs on the 2nd mora (Demers, Escalante, Jelinek 1999) and shifts to a different vowel when the vowel shortens to maintain its 2nd-mora positioning (Hagberg 1993).

(12) [kaáte]   'walk.around.PL'

(13) [katéka]   'walk.PL.PPL'

However, even in forms in which pitch accent distinguishes minimal pairs, such as *kaáte*, 'walk.pl' and *káate*, 'build.house' (14), (15), no rule has been established concerning whether or how to indicate the pitch accent shift following shortening, even when shortening results in minimal pairs.

(14) *káate* [káate] (build.house) (also occurs as *ka'ate*)

(15) *kaáte* [kaáte] (walk.around.PL)

If we mark pitch accent on both, the accent in *kaáte* 'walk.pl' shifts to second mora following shortening, but does not shift in *káate* 'build house'. But shifted pitch accent is not marked, and shortened vowels are not usually marked. Consequently, forms like *kateka* are homographs between 'walking around' and 'building houses', even though they are not homophones, one being [katéka] and the other being [káteka]. One possible solution is to mark the 1st-mora cases only, and continue to mark them even under affixation-driven vowel shortening, since in those lexemes pitch accent placement does not change, and the diacritic will help learners to access the correct underlying stem, since it would also be the one that has the accent in the underived form. This solution would yield the following spellings for this set of forms, none homographs with any other:

(16) a. *kaate*   'walk around.PL'   (pitch accent 2nd mora)
     b. *kateka* 'walking around.PL'(pitch accent 2nd mora, i.e. on [e])
     c. *káate*   'build house'   (pitch accent 1st mora)
     d. *káteka* 'building houses'   (pitch accent 1st mora)

4.3.2 Word boundaries

Clitics exist in that awkward space between affix and independent word, and it is difficult to know how to treat them orthographically. In Hiaki, which has 2nd position subject clitics and preverbal object clitics, they are usually written as separate elements.

(17) Aman ne tevote
    Aman=ne tevote
    There=1SG.NOM greet
    'I send greetings there.'

(18) Inepo am vichak
    Inepo am=vichak
    1SG.NOM 3PL.ACC=see.PST
    'I saw them.'

But this is a tendency, not an absolute rule, as shown in (19) and (20).

(19) katee
    kat=ee
    Don't=2sg.nom
    'Don't you…'

(20) keche
    ket=ee
    still=2sg.nom
    'You still…'

Our working hypothesis regarding when clitics are treated as dependent, rather than orthographically separate elements, is based on the interactions between prosodic groupings and syntactic attachment requirements. For example, although preverbal object clitics are morphosyntactically located immediately preverbally, in a quite rigid fashion, it appears from preliminary phonetic study that they do not form part of the verbal prosodic cluster, but rather are grouped with the preceding syllables; in particular they form part of the falling pitch contour from the previous word. (St. Amour 2016) Their representation as an independent orthographic word, despite their morphosyntactic and prosodic dependence, then, may follow from this tension between morphosyntactic groupings and prosodic ones.

4.4 Surface leaning

As we have seen, Hiaki orthography is not entirely 'surfacey', but it leans harder in that direction than it does towards deep representation. Our choices have generally reflected this leaning, also. There is, also, some evidence that L2 learners rely more heavily on lexical storage than on analysis and processing of morphologically complex items. (Silva & Clahson 2008) Therefore, an argument can be made that focusing on providing a model that aids correct pronunciation and performance of the language may be the more useful approach.

5   Conclusion

5.1   Reflections

The issues discussed here point to questions regarding the role of linguists in language work that prioritizes community over academic impact. Although we consider the ideal scenario to be one in which linguists operate as facilitators, helping to guide and implement policies and practices which are directed by community consensus, this scenario is all too frequently not the one in which we find ourselves working. Our scenario is one that involves linguists taking on the role of decision makers, with relatively limited community feedback and advice.

The benefits of pedagogical and descriptive work for linguistic theory and understanding cannot be overstated. In the process of laying out the fundamentals of Hiaki grammar in a manner that is comprehensible by a broad audience, we have been confronted clearly with several gaps and inconsistencies in existing descriptions. This has led to focused and sustained effort towards understanding aspects of the grammar which we, initially focused on mophosyntax, might otherwise have given little consideration to, such as the vowel length rules, and an accurate description of the pitch accent system.

5.2   Summary

A working orthography is, like any aspect of language, a complex and evolving beast. Our experience shows that even implementing an existing, functional, relatively consistent, and well-described orthography, is a process which requires constant negotiation. Depending on the nature of the resource being produced, orthographic choices take on a greater level of significance, and this is never more true than in the creation of dictionaries and pedagogical materials. Relevant factors include the tension between surface versus deep representation, learner needs, managing dialectal variation, and the language contact context – in particular, the influence of majority language orthographic choices and also majority language morphophonological processes. Finally, when working with an underdescribed language, an incomplete understanding of linguistic processes and their interactions can further multiply difficulties.

References

Brewer, J. 2007. Phonetic reflexes of orthographic characteristics in lexical representation. PhD. Dissertation, U of AZ.

Council, P.Y.T. 1984. Yaqui language policy for the Pascua Yaqui tribe: Policy declaration. *Tucson, AZ: Tucson Unified School District*.

Dedrick, J. M. and Casad, E. H. 1999. *Sonora Yaqui language structures*. Tucson: University of Arizona Press.

Demers, R., Escalante, F., & Jelinek, E. 1999. Prominence in Yaqui words. *International journal of American linguistics*, 40–55.

Dorian, N.C., 1994. Purism vs. compromise in language revitalization and language revival. *Language in Society*, *23*(04), 479–494.

Fernández, Zarina Estrada et al. 2004. *Diccionario yaqui-español y textos: Obra de preservación lingüística*. Hermosillo, Sonora, Mexico: Universidad de Sonora; Mexico City: Plaza y Valdés Editores.

Hagberg, Larry. 1993. An autosegmental theory of stress. PhD. Dissertation, University of Arizona.

Hagberg, Larry. 2001. Mayo practical orthography. In *Avances y balances de lenguas yutoaztecas*, *Homenaje a Wick R. Miller* ed. by Jose Luis Moctezuma Zamarrón y Jane H. Hil. Mexico, DF: Instituto Nacional de Antropología y Historia.

Harley, H., Mercedes Tubino Blanco, Jason Haugen. 2014. Affixal light verbs and complex predicates in Hiaki. In *Current issues in complex predicate research*, edited by Hideki Kishimoto and Yoko Yumuto. 257–290. Tokyo: Hituzi Syobo.

Harley, H, and Mercedes Tubino Blanco. .2013. Cycles, vocabulary items and stem forms in Hiaki. In O. Matushansky and A. Marantz, eds., *Distributed Morphology Today.* Cambridge, MA: MIT Press. 117–134.

Harley, H. 2014. "On the identity of roots," (Target article). *Theoretical Linguistics* 40.3: 225–276.

Haugen, J. and H. Harley. 2013. On the implications of head-marking inflection for the architecture of grammatical theory: Evidence from reduplication and compounding in Hiaki (Yaqui). In A. Fountain, M. Miyashita, D. Cole and S. Bischoff, (eds), *The persistence of language: Constructing and confronting the past and present in the voices of Jane H. Hill.* 133–174. Amsterdam: John Benjamins.

Haugen, J, H. Harley and M Tubino-Blanco. 2008. "¿Es el sufijo *-ri* un nominalizador pasivo en yaqui?". Proceedings of IX Encuentro de Lingüística en el Noroeste, Vol. I, 193–210. Editorial Unison, Hermosillo, Son., Mexico.

Molina, F., Shaul, D. & Valenzuala, H. 1999. Yoeme-English English-Yoeme Standard Dictionary. New York: Hippocrene Books.

Share, D.L. 2004. Orthographic learning at a glance: On the time course and developmental onset of self-teaching. *Journal of experimental child psychology*, *87*(4), 267–298.

Silva, R. and Clahsen, H. 2008. Morphologically complex words in L1 and L2 processing: Evidence from masked priming experiments in English. *Bilingualism Language And Cognition*, *11*(2), 245.

St. Amour, L. 2016. Hiaki Pitch Accent. Ms University of Arizona.

Trujillo, O.V. 1991. *Yaqui views on language and literacy*. PhD. dissertation, Arizona State University.

Tulloch, S. 2006. Preserving dialects of an endangered language. *Current Issues in Language Planning*, *7*(2-3), 269–286.