Common Orthographic Causes of Reading & Writing Errors

ORTHO22, RUIRU, KENYA, MARCH 2022

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Overview

• Testing methods
  • Informal testing results in Dadiya [dbd]
  • Informal testing in Jju [kaj]
  • Formal testing results in Yoruba [yor]
  • Formal testing results in Kabiye [kbp]
  • Formal testing results in Dan [dnj]
  • Summary

Adamawa; Nigeria (Harley 2017)
Plateau; Nigeria (Norton & Harley 2019)
Defoid; Nigeria (Harley et al 2015)
Gur; Togo (Roberts 2008, 2010)
Mande; Côte d'Ivoire (Roberts et al 2019)
Orthography testing

Testing methods:

<table>
<thead>
<tr>
<th></th>
<th>Words &amp; phrases</th>
<th>Texts</th>
</tr>
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<tbody>
<tr>
<td>Reading</td>
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<td>Composition test</td>
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• Each test can also involve group discussions.
• Preference test & group discussion for ACCEPTABILITY.
• Dictation, Reading and Composition test for USABILITY.
Points to remember when testing

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• Orthographies are for both **Reading & Writing** - The best orthography is one that people can both read AND write most easily.
• Reading is not the same as visual word recognition.
• There are probably more possible orthographic options worth testing that you think (For the Tuwuli word ŋwaɛ, there were 11 different spellings out of 12 people).
• Reading and Writing tests are often the best way to persuade users that other orthographic options might be preferable.
Dadiya [dbd] (Adamawa; Nigeria)

**Testing method:**
- 2 afternoons.
- 3 literate participants (translators).
- Each asked to write an original text overnight, half to two pages in length.
- One by one, the texts were given to someone other than their author to read aloud, without any preview time.
- Any unnaturally long pauses or miscues were investigated as to their cause.
- The process highlighted a number of orthographic issues that caused reading or writing errors.
- Participants clearly saw the need for changes after the tests.
Top causes of reading/writing errors

1. **Sub-diacritics** <ɨ> <ɛ> <ə> <ɔ> <ʊ>
   - Many missing underlines also found in the NT (75% drafted).
   - Team opted to use <ɨ> <ɛ> <ə> <ɔ> <ʊ> instead.

2. **Vowel elision and word breaks**
   - Apostrophes often written for elided vowels: <nɑ̃g’a> vs <nɑ̃go a>.
   - Problem with the locative preposition and certain pronouns.
   - Many inconsistencies in the NT (sometimes in the same sentence).
   - Team wanted to write forms out in full with word breaks.

3. **Vowel length** – long vowels sometimes written as short vowels
Dadiya other issues - group discussion

4. **Grammatical tone** (FUT vs HAB) also an issue.
   - Punctuation marks preferred to accents

5. **Compound words**
   - Many compound words in the NT were often written unhyphenated, generating some unusually long words in a language in which the vast majority of words were no longer than two syllables.
   - Cross-linguistically, average word length is usually the most predictive factor of how difficult a text is to read (Rayner et al 2012).
   - Suggested solution:
     - `<nəbkoτəmkaŋatɨnɔ> → <nəb-kotəm-kəgatɨnɔ>` - the prophets
     - `<tɨyəmweŋtɨnɔ → <tɨya-mweŋtɨnɔ>` - the boats
Jju [kaj] (Plateau; Nigeria)

Testing method:
• 4 afternoons.
• 2 literate participants (translators).
• each asked to write a short original text.
• Each text was given to the other author to read aloud, without any preview time.
• Any unnaturally long pauses or miscues were investigated as to their cause.
• We had been alerted to some potential problems, but the process highlighted a number of others as well.
• Participants clearly saw the need for changes after the tests.
Jju testing and discussion results

• Causes of reading/writing errors

1. **Lexical ambiguity** (e.g. Four different forms spelled <ba>)

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<td>index ba ‘they’</td>
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2. **Grammatical tone**
   - Pronouns: you (sg) vs them (na- class).
   - TAM: Perfective vs Hortative, Progressive vs Subjunctive

3. **Vowel length in polar question particle (-V)** not always marked.
Jju testing results

1. **Lexical ambiguity**

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   The definite <ba> was found to be the main cause of ambiguity. Decided to mark it with a preceding hyphen: <banyet-ba> – the people.

2. **Grammatical tone** - Accents to be used for less common forms.

3. **Vowel length in polar question particle** – all long vowels to be checked.
Yoruba [yor] (Defoid; Nigeria)

**Formal testing:**
- Preparation and administrator training (1 week), testing (2 days), scoring (2 months), analysis (2-3 months)
- Part of a bigger experiment - 10 languages (Roberts & Walter 2021)
- Four original texts orally translated, then transcribed.
- 27 participants (adult literates), each reading all four texts, presented in various orders.
- Each participant read two tone-marked texts and two non-tone-marked texts.
- Participants were asked 3 comprehension questions after each text. Whole experiment conducted in Yoruba by a trained facilitator.
- Readings were recorded and timed.
- Participants also asked to add accents to the two unmarked texts.
Yoruba [yor] (Defoid; Nigeria)

- Recordings assessed by a MT speaker for reading errors (insertions, omissions, substitutions, and repetitions).
- Graphs plotted for average error points for every syllable in all four texts.
- Major error peaks discussed with facilitator as to likely causes.
Yoruba testing results

• 27 major peaks among all 4 texts (897 words in total)
• Major peak errors divided into 5 categories:
  1. Lexical ambiguity: 11 major peaks
  2. Juncture issues (e.g. word & morpheme breaks): 8 major peaks
  3. Grammatical ambiguity: 4 major peaks
  4. Structural ambiguity: 3 major peaks
  5. Unfamiliar words: 2 major peaks

• Lexical and grammatical tonal ambiguity caused six out of the ten biggest error peaks.
Yoruba general testing results

• Few reading errors outside major peaks.

• Overall, no significant difference in reading fluency between accented and non-accented texts.

• Why? Because readers long exposure to written Yoruba had helped them to learn to read Yoruba just as well without accents.

• Only 6 out of the 27 participants understood tone well enough to add accents accurately to the unaccented texts. Accents often helped these readers in places, but made little difference to the rest.

• Conclusion: Most accents are unnecessary; accents are useful only in certain key places, as long as readers understand them.
Yoruba testing results

1. Lexical tonal ambiguity

< wón gbá ọmọ náà mu >

they grab child the hold

They grabbed hold of the child.

gbá...mu – grab (uncommon)

gbà – take (common)

No errors here for those who understood tone marking well.
Yoruba testing results

2. Grammatical tonal ambiguity

< Ǹkan tí  o  ṣe  yìí >

Thing  REL  2sg  do  DEM

This thing that you have done...

o – 2sg (less common)

ó – 3sg (common)
Yoruba testing results

2. Lexical and grammatical ambiguity

Other problem morphemes (many very common):

- máa – FUTURE
- màá – I will
- má(a) – HABITUAL
- má – Prohibitive
- mà – indeed
- wà – be
- wà – drive
- wà – dig up
- wá – look for/want
- wá – prepare food
- wá – come
- ni – be
- ní – have
- ní – in/at
- ní – say
Yoruba testing results

3. Juncture issues (vowel length)

< ràn án >  /r̀-̀a/  [r̀̀a]  - send him
< síhìn-ín >  /sí-ìh́-í/  [síh́̀́í]  - to here (EMPH)
< wáà >  /wà-a/  [wàa]  - be (EMPH)

Phonologically lengthened vowels written in a variety of ways.
Yoruba testing results

4. Juncture issues (vowel elision & word breaks)

V + N  <ṣòfò>  /ṣe ḏfò/  – mourn (lit. do mourning)

Prep + N <níbi>  /ní iби/  – at the place (written together about 70% of the time)

Prep + N <síhìn>  /sí ịhùn/  – here (written together about 80% of the time, although <sí> is typically written separately elsewhere).
Yoruba testing results

5. Lexical ambiguity (subdots & tone)

< Baálé ilé ni ọkùnrin nàà >

family:head house COP man DEF

That man was a family head

baálé – family head (common)

baálẹ̀ – village head (more common)

Four out of six times this word caused a major error peak, but was rarely a problem for those who understood accents well.
Yoruba testing results

6. Structural ambiguity

<ihò wọn> – …pit, they…

<ihò wọn> – their pot

7. Uncommon words

<há> – wedge (occurs only 57 times in a database of 2.8 million words)

<oṣó> – sorcerer
Yoruba testing conclusions

1. Accents reduce errors in places of lexical and grammatical ambiguity.
2. If both ambiguous words are common, both may need to be marked. Otherwise only the uncommon word may need an accent.
3. Sub-diaccritics cause reading errors.
4. Consistency needed in the case of long vowels.
5. Vowel elision across word boundaries presents a continuum between one word and two words.

One word                   Two words
<nígbà> - at time           <ní ibí> - at place
<ní ọjọ> - at day

Maybe best to prescribe either one word or two words for clearer cases and common expressions, but permit variation for more ambiguous cases.
Yoruba vs Ife results

1. Yoruba and Ife represent two ends of the Ede dialect continuum and are linguistically and orthographically very similar (>80% cognates).

2. Tone marking in Ife is well understood (82% average accuracy) compared to Yoruba (27% average accuracy) and significantly improves reading speed, tonal accuracy and comprehension.

3. Overall, the Yoruba are much faster readers than the Ife. The social profiles of the participant in terms of years of education and exposure to print are more predictive of reading and writing performance than are the linguistic and orthographic profiles of the language.

4. Tone marking is more helpful for beginning readers, but experienced readers need them less and less.
Kabiye [kbp] (Gur; Togo)

**Formal testing results:**
- Functional load of tone is more grammatical than lexical.
- Verbs attracted most reading errors.
- Prefix + verb root often ambiguous with other verb roots.
- Grammatical tonal ambiguity.
- Lexical tonal ambiguity also contributed to reading errors.
- Semiographic representation of grammatical tone better than a phonological representation.
Formal testing results:

- Functional load of tone is extremely high, both lexical and grammatical.
- 5 level tones, 4 falling and 2 rising tones. Stable tone. Mostly monosyllabic.
- Dialect diversity, homophony, tonal minimal pairs, visually similar words, under-representation of tone, and misspelled words all contribute to reading errors.
- Tested punctuation marks vs accents for marking tone, and diacritics vs no diacritics for individual letters
- Punctuation marks performed better than accents for marking tone, for both readers and writers.
- Letters without diacritics performed better than letters with them.
- However, Government and local stakeholders are now adopting accents. Thus the social process of participating in a quantitative classroom experiment is more convincing than the scientific results of it.
Conclusions

• Tonal ambiguities, word breaks, sub-diacritics, verb root boundaries, dialect differences and unmarked long vowels are responsible for the vast majority of reading errors.
• Word breaks present a continuum of integration and may need to be dealt with on a case by case basis.
• Partial/selective tone marking systems may work even in languages with a high functional load of tone, although this can be hard to implement without clear guidelines (e.g. mark the first syllable of all verb and noun roots).
• The more exposure to print readers have, the less tone marks are needed.
• Semiographic representation of grammatical tone is often preferable to a phonological one.
• Marking of lexical tonal pairs depends on frequency of the words in question: both may need to be marked, unless only one of the pair is very uncommon.
Questions for discussion

1. How have lexical tonal minimal pairs/triplets been handled in the languages that you work with?

2. What experience have you had in testing orthographies?

3. What fluency problems have you seen in the languages you work with that cause problems in reading and writing?

4. What do you think could be some of the possible causes of such errors?
References


