
Skilled reading in isiZulu: what can we learn from it?

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Abstract

Research on reading in African languages is particularly pertinent in South Africa now, in view of the poor reading performance in many South African schools. This paper is based on a study of competent adult readers of isiZulu that analysed what its orthography (the way it is written) requires of readers. As an agglutinative language with a conjoined writing system, isiZulu carries meaning not only in separate words, but also in morphemes that cluster together, forming long complex words. Eye tracking data shows that competent readers of isiZulu move their eyes across text in saccades (shifts of the point of focus) that are short in comparison with the saccades of efficient reading of English. It also shows that readers of isiZulu fixate on points of text for longer periods than do readers of English.

The study links eye movement data to information gained from a stimulated recall process, to discover strategies consciously used by competent readers of isiZulu. Some of these strategies, such as visualisation, are common to efficient readers of all languages, while others might be peculiar to agglutinating and/or tonal languages. These strategies inform suggestions for the development of effective reading skills in isiZulu.

The key argument of the paper is that the orthography of isiZulu has features that require attention by teachers of reading if their learners are to benefit from the advantages that reading in their first language should bring.

Introduction

Many South African children do not develop adequate reading skills in their home language. In KwaZulu-Natal (KZN), where nearly 77% of the province's 10.2 million people are first language speakers of isiZulu (Statistics South Africa, 2011), conditions conducive to the development of effective reading skills in the language most familiar to them appear to exist for few children.

Our education system is beset by a range of debilitating historical, political and practical factors, which frequently combine to impede learning. Where these factors coincide with limited preschool exposure to reading (Pretorius

and Mampuru, 2007) and teachers' orientation towards reading as an oral performance rather than comprehension, noted by Trudell and Schroder (2007), the situation reflected in ANA scores (described below) should surprise no-one. However, a crucial and overlooked weakness in the system is that South African teachers tend to be inadequately trained in the teaching of reading (Pretorius and Mokhwesana, 2009; National Education Development Unit, 2013). Perhaps because there is little research on reading in African languages (Land, 2015), and an abundance on reading in English, available pre- and in-service training in teaching reading is shaped by methods favoured for teaching reading in English, whose structure and orthography differs markedly from that of indigenous African languages. Yet if children who are first language speakers of isiZulu are to benefit from the advantages that reading in their first language should bring, teachers should have a keen understanding of why some features of the orthography of isiZulu require particular attention in the teaching of reading. Effective teachers of reading enable their learners to develop skills in response to these features, and to use these skills to master the mechanical aspects of reading so that their attention can be devoted more readily to accessing the meaning of texts.

Thus the aim of the draft policy entitled Incremental Introduction of African Languages (Department of Basic Education, 2013) of strengthening "the use of African languages at Home Language level" must be applauded. However it is difficult to see how this policy's suggestion of the addition of another language to the curriculum will facilitate this, especially when learners are clearly struggling with reading in their own home languages.

A useful body of research on children's acquisition of reading skills in indigenous South African languages is growing (e.g. Pretorius and Mampuru, 2007; Verbeek, 2010; Van Rooy and Pretorius, 2013; Pretorius, 2014). The study reported on here focuses on the well-developed reading skills of mature readers, so offers a complementary angle, noting adults' eye movement patterns, and describing strategies they use to read isiZulu rapidly and efficiently. It is hoped that identification of these strategies could contribute to the development of pedagogical principles pertinent to the teaching of reading.

Reading processes that educators should understand

Researchers recognise reading as “arguably the most complex cognitive activity in which humans routinely engage” (Reichle, Warren and McConnell, 2009), yet educationalists often underestimate the complexity of the processes that beginners need to master: decoding visual symbols into language while simultaneously constructing a coherent conceptual representation of meanings contained in text.

To decode alphabetic script, readers shift their focus systematically along successive lines of text, registering sufficient features in the text to identify combinations of letters representing successive words or other units of language. To do this, readers match visual patterns in the text with their existing orthographic, phonological and semantic concepts of language (Reichle, Liversedge, Pollatsek and Rayner, 2008). So recognition of a word involves responding to its representation in print by thinking of how it sounds (its phonics) and what it means (its semantics).

To read with understanding, readers must also accumulate information from the text in short term memory. This process is described by Rapp and Van den Broek (2005, p. 277) as:

. . . developing concepts [that] fluctuate in activation as a function of four sources:

- (a) text input in the current cycle,
- (b) residual information from the preceding cycle,
- (c) the memory representation constructed for the text read so far,
and
- (d) the reader's prior knowledge.

These fluctuations result in a ‘landscape’ of activations, with concepts waxing and waning in activation during reading.

This waxing and waning of concepts relates to readers’ developing mental representations of the meaning of text as they extract information from print, and anticipate the next words, continually confirming or disconfirming predictions as they progress. This was first described by Kenneth Goodman in his famous definition of reading as ‘a psycholinguistic guessing game’

(Goodman, 1967). As this view of reading became widely accepted, it inspired changes in the ways reading was taught, since it focused attention squarely on readers' constructing mental representations of meanings text. An unfortunate consequence was that in many reading programmes, teaching of mechanical decoding skills was abandoned instead of being supplemented by strategies aimed to enhance the construction of meaning.

It is likely that higher order cognitive meaning-making processes are similar for readers of all languages. However, at the more mechanical level of decoding print to words, it is apparent that readers respond differently to different orthographies. Particularly pertinent to this paper are differences between orthographies where letters consistently and reliably represent the same speech sounds (as they do in isiZulu), and orthographies where the relationship between letters and speech sounds is inconsistent. Research shows that readers of languages with transparent and consistent orthographies such as Greek, Finnish, and Italian decode text by matching graphemes (letters, or letter combinations) to phonemes (speech sounds). In contrast, readers of opaque, inconsistent orthographies such as English develop other strategies because letters do not always represent the same sounds (Georgiou, Parrila and Papadopoulos, 2008). Linked to this is the psycholinguistic grain size theory proposed by Ziegler and Goswami (2005). This suggests that the letter groupings relied on by readers of opaque, inconsistent orthographies to reconstruct language are significantly larger than the letter groupings relied on by readers of transparent consistent orthographies. This is because speech sounds are represented more consistently by large grain size units of text in opaque orthographies than small grain size units. In other words, while single letters can represent a range of speech sounds, groups of letters forming syllables tend to represent speech sounds more reliably; for example, none of the letters in the word 'range' can be counted on to represent particular speech sounds in English, so recognition of whole words such as 'range' and 'anger' is necessary.

Orthographies make up a continuum with consistent, transparent orthographies (where spelling predicts pronunciation) at one extreme, and opaque, inconsistent orthographies (where spelling does not reliably predict pronunciation), at the other. The orthographies of isiZulu and English, in which most people in KwaZulu-Natal must develop reading skills fall at opposite ends of this continuum. This has significant implications for acquiring and exercising reading skills, which should be taken into account in the teaching of reading and the training of reading teachers. Teachers should

be keenly aware of the importance of ensuring that their learners understand the differences in ways in which letters of the alphabet are used in each language. As one example of many differences, ‘c’ can be involved in four different speech sounds in English, none of which remotely resembles the click consonant it always represents in isiZulu

When learners learn to read in their first language, their existing vocabulary, phonemic knowledge, and understanding of the structure and functioning of the language should aid their prediction and recognition of words. Also, their established confidence in using their mother tongue to give and receive information should facilitate their construction of a conceptual representation of a text’s meaning. Yet Van Rooy and Pretorius (2013) found that grade 4 children whose first language is isiZulu read English faster, even when they need English instructions translated into isiZulu in order to understand them. This is in stark contrast to findings relating to European languages with transparent orthographies in which children achieve reading competence far more quickly than English children (Georgiou, Parrila and Papadopoulos, 2008; Seymour, Aro and Erskine, 2003). Reasons for this are unknown but may relate to the textual features described below, and/or point to inadequate training of teachers in terms of how to teach reading, and/or to attitudes toward reading, such as the common sub-Saharan African perception that reading is primarily an oral performance (Trudell and Schroeder, 2007). This may prevent many teachers from emphasising reading for meaning and using silent reading exercises in class. In observed reading lessons in local schools in 2013, the only activity noted was reading aloud (Mather, 2013; Sivnarain, 2014). It would ease the task of teachers to know that short exercises in silent reading, where learners practised the skills of predicting, deducing and concluding, and received immediate feedback, would be a powerful strategy to encourage readers to read for meaning.

Reading and the orthography of isiZulu

It has been suggested (De Vos and Katz, 2013) that symbols representing whole syllables might have been a better writing system for African languages than the Roman alphabet. If settlers from Europe had not colonised Southern Africa and invented writing systems for the languages they found there, the Ethiopic script might have made its way to southern end of the continent and been adopted by speakers of Bantu languages. Ethiopic script, an adaptation

of South Arabian script, represents a syllabary of 182 symbols, each representing a consonant + vowel combination (Comrie, 2003).

Indigenous South African languages have a general Consonant – Vowel syllable pattern, so would be well accommodated by syllabic symbols, especially since only five vowel sounds need to be represented, and the restricted number of permitted syllables would limit the number of symbols needed to represent them. Such a system would have the advantage of reducing the length of words because single symbols would represent speech sounds that require two or more letters in the Roman alphabet, for example, *ngu-* and *ba-*, and even possibly syllables with multiple consonants such as *-ntsha* and *-nywa*. This might have the effect of easing and speeding the process of learning to read, and increasing the reading speed of competent readers. Thus the Roman alphabet might not be the most elegant or appropriate writing system for Southern African languages, and it presents readers with particular challenges. However, with the Roman alphabet now established and in use for indigenous South African languages and their growing body of literature, it is simply too late to change scripts. At least the Roman alphabet carries the benefit of transfer of learning when learning to read in many of the world's currently dominant languages that share its use.

Factors that facilitate reading

With near perfect correlation between letters and sounds¹ isiZulu orthography is transparent and consistent.

Initial acquisition of reading skills is aided by the regular, dependable relationship between letters and speech sounds in shallow orthographies (Trudell and Schroeder, 2007). Children learning to read the transparent, consistent orthographies of Greek, Spanish, Finnish, and Italian, can read unfamiliar words aloud correctly at the end of grade 1 (Ziegler, Bertrand, Tóth, Csépe, Reis, Fáisca *et al.*, 2010). In contrast, 'deep' orthographies, like that of English, are characterised by irregular relationships between letters and speech sounds where single letters represent a range of speech sounds or

¹ The letters 'n', 'd', 'h', 's', and 'l' are exceptions, representing two phonemes as 'n' does in the English words 'can' and 'ink'.

may be unvoiced. Unsurprisingly, children learning to read English take three times as long to develop the ability to recognise words as children learning to read in transparent, consistent orthographies (Seymour, Aro and Erskine, 2003).

Research has not yet established how long it takes, or should take, for beginner readers of isiZulu to recognise unfamiliar words, and no benchmarks exist for the development of reading skills in isiZulu (Van Rooy and Pretorius, 2013). What is expected of learners at the end of grade 1 ranges widely, from recognition of letters and some single words, to reading short stories (Verbeek, 2010). In stark contrast to the plodding pace of reading development in many South African schools, a startling Reading to Learn² DVD shot in September 2014 (Reading to Learn, 2014) shows enthusiastic Grade 1 township children successfully reading a whole story and writing the sentence ‘*Ugogo uyasixoxela inganekwane*’ (Granny tells us a folk tale) directly from dictation. This indicates that with teaching strategies that focus on decoding and meaning, proceed at a stimulating pace, and take advantage of the benefits of a transparent, consistent orthography, progress can be rapid.

Factors that may impede reading development

The orthography of isiZulu poses several challenges for readers

Firstly, its agglutinative structure and conjoined writing system give it unusually long and complex words. To illustrate, the Lix readability formula (Readability Formulas.com, 2014), designed to gauge readability across languages benchmarks easy to read text at a score of 20, average text at 40, and difficult text at 60. Text from newspapers in ten European languages scored between 47 and 65 (Björnsson, 1983), but if the formula is applied to text from the isiZulu newspaper *Isolezwe*, the Lix score is 97.³

The complex words of isiZulu are composed of word stems and affixes, and

² Reading to Learn is an organisation that promotes a reading teaching method focusing particularly on understanding how parts of sentences and paragraphs relate to each other to create meaning.

³ The comparison is illustrative only of word length, since the validity of the Lix formula for African languages has not been established.

readers must register the meaning of the stem and note its modification by each affix. The logic of psycholinguistic grain size theory (Ziegler and Goswami, 2005) suggests that readers of isiZulu are likely to process small grain size units of text as a sure, quick route to reconstructing language because readers must distinguish between morphemes of usually one to three letters. For example, in the word ‘*asimthandazele*’ (let us pray from him/her) readers must recognise the five morphemes (*a/si/m/thandaz/ele*) – a stem preceded by three affixes and succeeded by another. A change of one letter in one affix changes the meaning, (e.g. *animthandazele* = you (plural) should pray for him/her). This small grain parsing could contribute to the high number of fixations, long fixation duration, and frequent regressions noted among proficient readers of isiZulu (Land, 2015). The implications of this for teachers of reading is that exercises that stimulate and heighten learner readers’ rapid perception of shifts in arrangements of morphemes, and the concomitant shifts in meaning are important for the development of effective reading skills. Exercises designed to develop readers’ ability to instantly recognise high frequency non-agglutinated short words and high frequency word forms with only two or three morphemes would be equally useful.

Secondly, although tone modifies meaning in spoken isiZulu, there are no tone markers in written isiZulu. For example, *-nga-* can have a negating effect in a low tone, but indicate potential in a high tone. So ‘*Lomntwana angajovwa*’ if *nga-* is low toned means ‘This child must not be vaccinated’, but, if *nga-* is high toned means “This child may be vaccinated”. Therefore readers must either hold alternate meanings in mind where there is ambiguity until they confirm meaning from contextual cues, or reread phrases to decide on their meaning. This could contribute to the high rate of regressions among competent readers of isiZulu (Land, 2015). The implication for educators here is that teaching readers to find contextual cues would help them discern appropriate tone in spite of the absence of tonal markers.

Finally, especially in comparison with English, isiZulu has a low number of permissible letter combinations, partly because of the CV syllable structure, and partly because there are no contiguous vowels or double consonants. Short letter strings such as *zi*, *ku*, *ka*, or *nga*, recur frequently, either as distinct morphemes or parts of larger morphemes, with different meanings in different contexts. In a comparison of texts of approximately 25 000 characters each from isiZulu and English newspapers (*Isolezwe* and *The Mercury*) 18 three letter strings recurred more than 100 times, and 3 four letter strings recurred more than 100 times in the isiZulu text. In comparison,

only 5 three letter strings (*the, ing, and, ent* and *her*) and no four letter strings recurred more than 100 times in the English text. The effect of this is that words are not as visually distinct from one another in isiZulu as they are in English. Since new readers take longer to learn to distinguish between visually similar words than obviously dissimilar ones (Abadzi, 2011), this feature could have implications for the progress of learner readers, and possibly requires the relatively short saccades and long duration of fixations noted among proficient readers of isiZulu (Land, 2015).

Indications from preliminary eye movement data about readers' responses to this orthography

In all eye movement reading research, data are measures of:

- fixations: points in the visual field focused on, and clearly seen; competent readers demonstrate a pattern of consecutive fixations along each line of text. Fixations are measured in terms of frequency, position and duration;
- saccades: the movement of the point of focus between fixations; in reading, saccades are measured in terms of letters between fixations;
- regressions: registered if a reader looks backward in the text, shifting the point of focus to the left; regressions are measured in terms of frequency and length.

Linguistic and cognitive processes affect eye movements (Reichle *et al.*, 2008; White, 2008), and studies in different languages show that saccade length and the duration of fixations vary across orthographies (Osaka, 1992; Reichle, Rayner and Pollatsek, 2003; Liversedge and Findlay, 2000). Since fixations are linked to attention (Paulson, 2005; Mielle, O'Donnell and Seren, 2009) eye movement patterns can yield information about how readers respond to particular textual features, and their reading strategies.

Eye movement data on competent readers of isiZulu, discussed in detail in another paper (Land, 2015), suggest that when reading isiZulu text, they:

- skip 1% of words, apparently recognising them in parafoveal vision since they register their meaning; these words tend to be frequently used, short non-agglutinated words (e.g. *uma, nje*).
- read 25% of words in a single fixation, thus apparently automatically recognising them; these words are mainly short non-agglutinated words or high frequency words with not more than two morphemes (e.g. *kodwa, zakhe, umuntu*).
- require a relatively long period to process the text perceived in each fixation compared with readers of other alphabetic languages for which data is available; the average duration of fixations of readers in this study was .3 seconds.
- appear to process small grain size units of text as they read, since their average saccade length was 4.05 characters.
- make regressions as frequently as readers of other alphabetic languages in terms of time, making 1 regression every 1.89 seconds, and with 16% of fixations being regressions; however, in terms of regressions over spans of text they regress more, at 1 regression every 24 characters.

IsiZulu orthography is relatively time consuming to read in comparison with other alphabetic languages for which data is available; reading rates of participants in this study, all of whom demonstrated high competency, ranged from 621–1283 characters per minute (cpm). The average speed of the fastest ten in the sample was 1021cpm.

These figures suggest that adept readers of isiZulu use decoding strategies that differ from those of their counterparts in English, since in efficient reading of English:

- most words are instantly recognised during reading of continuous text, with 25% – 30% skipped (White, 2008; Rayner, 2009) and others recognised in one quick fixation;
- words of up to 9 letters (i.e. the majority of English words (Norvig, 2009)) are read in a single fixation, suggesting automatic recognition (New, Ferrand, Pallier and Brysbaert., 2006);

- fixations are short, usually .2 – .25 seconds (Reichle *et al.*, 2003 p. 446; Rayner, 2009; Hutzler, Ziegler, Perry, Wimmer and Zorzi, 2004); this suggests that readers can quickly glean the information they need from the text perceived in each fixation;
- saccades tend to be 7 – 9 characters, but can be up to 20 characters (Rayner, 2009; New *et al.*, 2006; Mielliet *et al.*, 2009), indicating that competent readers of English process large grain size units of text;
- roughly 10 – 15% of fixations are regressions, made about once in two seconds Reichle *et al.*, 2003, p.348; Rayner, 2009; Liversedge and Findlay, 2000), and approximately once every 50 characters.⁴
- at 300 words per minute (wpm), competent English readers are reading about 1380 characters per minute (cpm), which is notably faster than the cpm rates recorded by readers of isiZulu in this study (above).

These figures suggest that although English and isiZulu both use the alphabet, there are important differences in what readers must do.

The most salient of these differences appears to be that English is most efficiently read by seeking cues for word recognition in considerably larger letter groupings than is optimal for efficient reading of isiZulu. This is in line with the logic of psycholinguistic grain size theory noted above.

A corollary of this might be that while automatic recognition of words occurs in efficient reading of both languages, isiZulu orthography militates against it while English orthography facilitates it.

It might be logical to suggest that synthetic methods of teaching reading such as the syllabic method, which works well with isiZulu, possibly encourage readers to process small grain size units of text. However, processing small grain size units of text may be inevitably slower than processing larger grain size units of text. The outcome of this may be that reading in orthographies that lead readers to rely on large grain size processing, such as English and French, is potentially faster than reading in orthographies where large grain size processing is not necessary.

⁴

With 300 wpm considered competent in English (Rayner and Pollatsek, 1989) and an average word length of 4.6 letters (Björnsson, 1983), competent readers process 1380 letters per minute. So once in two seconds = $1380/30 =$ once for 46 letters.

Do competent readers of isiZulu consciously and effectively use particular decoding strategies?

This paper seeks to answer this question by relating details in eye movements mapped onto text to what readers remembered of those particular moments as they read.

Sample

Since there are as yet no standardised measures of reading proficiency for isiZulu (Van Rooy and Pretorius, 2013), an invitation to readers who saw themselves as proficient, and were interested in participating in research was circulated in Pietermaritzburg, and sent to people who regularly read isiZulu text in their work, including publishers of isiZulu texts, journalists, and lecturers of isiZulu. Approximately 150 respondents underwent a timed silent reading test (Appendix 1). On the basis of their speed and accuracy, the most efficient 25% of respondents (38 of them) were selected, and their eye movements recorded as they silently read four texts described below.

The recordings of 5 participants were technically flawed, and excluded. The remaining 33 included:

- 15 women and 18 men
- 24 professionals (11 of whom were part time post graduate students), 5 full time university students and 4 high school students.

The group ranged in age from 16 to 61, with 4 under 20, and 4 over 50, and 25 between 20 and 50.

Instruments

Instruments used were texts and the Swedish-built Visagraph eye movement recording system, with Reading Plus software. The Reading Plus organisation in the United States created an isiZulu language package specifically for this research, which mapped participants' eye movements directly onto electronic versions of the texts described below.

The four 100 word texts (Appendix 2) were extracted from novels written in isiZulu. Since there is no authorised grading system for isiZulu texts (personal email communication 2013/04/12 from Sabelo Zulu, Shuter and Shooter Educational Publishers, SA's largest publishers of isiZulu texts), a focus group was run to select texts for this study. Three lecturers in Education at UKZN, all first language isiZulu speakers, participated, judging a number of texts. They found the four texts used to be representative of isiZulu literature, with two texts considered easy to read, and two considered difficult to read. Although they relied on 'gut feel', their assessment matched measures of textual complexity. The 'easy to read' texts had 19 sentences (averaging 1.4 clauses per sentence), and 15 sentences (averaging 1.8 clauses per sentence) respectively. The 'difficult to read' texts, had 10 sentences (averaging 2.7 clauses per sentence), and 6 sentences (averaging 4.2 clauses per sentence) respectively.

They judged the vocabulary of the easier texts to match isiZulu spoken in urban areas, and noted that the more difficult texts contained terms and idioms from 'deep' isiZulu, spoken in rural areas, and used in formal academic isiZulu studies.

Word length is a key factor in readability formulae for text in European languages, (e.g. SMOG index, Flesch–Kincaid formula, Gunning Fog index, LIX), but average word length differed by less than 1 letter across these four texts, at 7.65, 7.47, 8.31, 7.49 letters in Texts 1, 2, 3, and 4 respectively.⁵

The texts were adapted in font type, point size, and line spacing to suit the Visagraph equipment, which uses infrared differential reflectivity and has a sampling speed of 60 Hz (Compevo, 2013). Recording systems with higher sampling speeds are available, but the Visagraph system was appropriate for this study because it records eye movement during natural silent reading of continuous texts, since:

- a flexible 2.4m cable connects the mask to a computer, allowing readers free head movement and natural reading positions not possible in systems where readers rest their faces in a frame;
- the system works in natural light;

⁵ This is comparable to text in the isiZulu newspaper Isolezwe, calculated to be 7.17 in a corpus of 5055 words from articles published in November 2013 from <http://www.iol.co.za/isolezwe>

- eye movement detectors are in the mask, allowing texts to be read from paper, and not computer screens.

Methodology

Readers' eye movements were recorded as they silently read the four texts referred to above. The Reading Plus package allows the replay of the recorded movement of a reader's point of focus (represented by a moving cursor) mapped onto an electronic copy of the text. Thus eye movements such as saccades, regressions and pauses, can be examined in relation to the points in the text where they occurred.

Immediately after reading each text, with the reading experience fresh in mind, each reader recounted what they remembered of the text in order to check their comprehension, and then participated with the researcher in examining the reading experience through a stimulated recall process. This involved following the recorded eye movements and relating features within it to what they remembered of particular moments in their reading experience. Information about strategies they used was gleaned from their recollections.

Strategies commonly used by proficient readers

Underlying all the readers' descriptions of their strategies was that they found these strategies helpful in their primary aim of discovering what texts were saying.

Automatic recognition of high frequency words

Predictably, readers are far more conscious of what they do when they do not automatically recognise a word than when they do. Eye movement data showed that these readers recognised approximately 25% of the words instantly, and that there was a significant correlation ($r = .743$) between faster reading rates and longer saccade lengths. This indicates that although it appears that readers of isiZulu rely on small grain size units of text, swifter, more competent readers have a higher rate of automatic recognition of combinations of small units of text than slower readers do. This enables readers to focus attention on the information in text rather than on the process of reconstructing language from print, thus enabling them to read more effectively than readers with a low automatic recognition rate.

Reconstruction of speech sounds as a small grain size processing strategy for complex words

An extract from the transcripts of the stimulated recall process illustrates this process:

SL And how do you manage . . . here [referring to the word *kwakungowokuphatha* [it was to do with child minding] there are one, two three four five six morphemes in that word. How do you do it in your head?

NN I think I read it slowly like *kwa-ku-ngo-wo-ku-phatha* – then I wanted to understand it.

SL You made the reading voice that goes in your head. . .

NN Yes I say the word.

SL . . . and went back to check if you saw it right?

NN Yes.

SL And you listen to it again in your head?

NN Yes. Exactly. That's what I did.

It is noteworthy that this research participant, a journalist on an isiZulu newspaper and one of the swiftest and most accurate readers in the group, is conscious of using this strategy to read this unusual construction. Her use of it suggests that it is the optimal strategy for decoding the multiple morphemes of complex agglutinated words – and indeed it is difficult to imagine what another strategy could be.

Looking for morphemes that modify meaning

Closely linked to the decoding strategy described above is attentiveness to features at morpheme level that modify meaning:

SL Then you said *wazibula ngamawele?* [gave birth to twins]

TM Oh yes that ...when I read the word *zibula* I was a bit hesitant. I was not sure whether she or he killed himself, and then I saw that they mean *wazibula*. . .

SL Oh – so you thought of ‘*wazibulala*’ [she killed herself] and *-bulala* is a more common word.

In this instance the eye movement record shows that the reader regressed to the word *wazibula* when her initial assumption of what the stem was (the much more commonly encountered stem *-bulala*) seemed odd to her. As miscues indicate incorrect prediction in reading aloud, regressions can point to incorrect prediction in silent reading.

Pausing and trying out different tonal options

Pauses reflected in eye movement records show where the reader has paused in the text, but not the reason for the pause. In the instance below the reader paused to consider alternate tonal options, for which the print carries no cue.

MG When I see the *unga-* and I’m reading it but I’m not hearing – I must think ‘Am I saying *unga-* (high tone) or am I saying *unga-* (low tone)?’ so I go back and make sure that it’s *unga-* (low tone)

The difference in tone that this reader engages with here is vital in her construction of the meaning in the text. She is referring to the word *ungakhathazeki* (you should not worry) where the morpheme *-nga-* would be spoken in a low tone. Spoken in a high tone in the same position in an agglutinated word it indicates positive potential. Here the reader clearly used contextual cues to decide which tonal variant of ‘*nga-*’ is intended.

Pausing to integrate elements of decoded meaning

Among these readers a common reason for pausing was taking a moment to consciously integrate elements of text they had decoded into a construction of the meaning of the text read so far. One said he ‘landed in a safe place to think’.

In another instance:

SL But you stopped there for quite a long time on this common word *kumnandi* (it is pleasant) . . .

NN I was thinking about this whole article . . . I think I did not understand it very well. While I was reading I was trying to understand the meaning so I found myself stopping somewhere.

This suggests a relatively high degree of ambiguities that readers must resolve in isiZulu orthography, and/or that its features compel readers to engage in a relatively long integrative process as they reconstruct the meaning in the text.

Rereading to make sense of text

In contrast to pausing, with the point of focus still for a moment, readers often shift their focus to the left in the text and reread some text. In this study, the most commonly expressed reason for rereading was to confirm or disconfirm the accuracy of an initial impression, or to resolve confusion. Instances were:

SL . . .then you went back to *indaba yami* (my story) and again you went twice to *yami*. Can you remember why?

KZ I think I was trying to figure out the meaning.

SL . . .then you went back to *okuvuthiwe*. Do you remember that?

NN I was trying to understand the word.

SL Because it's not normal to talk about *umuzi ovuthiwe*? (a baked or ripe house)

NN Yes . . . I was confused, and the word was long.

Visualisation of images

Readers' sustained focus on the meaning of text was evident from their descriptions of building mental representations of meaning in the texts as they read. Without prompting, the strongest readers talked about details of clear visual images that came to mind as they read.

SL And which schools were those?

ML It was a Cola Primary School, Khalipha Primary School, Isipingo Primary School, Umbelebele High School . . . all my schools . . . In Durban, all of them are built of red bricks. So if I read something of red bricks, it brings back the long block with a veranda. If you say two

verandas, it will be a veranda this side and other side – that how I got this idea.

ML Yes. The picture that was in my mind is this rural place, it is some rondavels painted white at the top and the bottom mud with top soil or black mud – *udaka*. And there are cattle, perhaps a few goats and few chicken all in a small place because I think this place belongs to a farmer. And usually farmers allocate some place to their workers. . . where they can live and plant a few vegetables and then they can keep some animals. So that was going on in my mind as I was reading this.

SL So you were constructing the picture as you read?

ML Yes.

Linking to previous knowledge

The source of information used by readers in the process of constructing meaning is obviously their own experience, or what they have learned from others, or from reading or media. Where the information gained from text is consistent with background knowledge, readers can progress steadily through text, but where it is not, readers tend to pause, and/or reread the text. This was evident in this study at points where eye movement records showed readers stopping momentarily, or rereading words or pieces of text, sometimes even three times. Excerpts from transcripts reveal their thinking as they did this:

TM I was not sure about the sentence because, really I never heard anything about the *impi* (war) between *amaNgisi namaBhunu* (the English and the Afrikaners). I only know the war between Blacks and Boers so I said to myself Mmh? Okay then, to me it is a something new.

TM . . . Then I went back again on Duda because I was not sure *umfowabo* (their brother) uDuda or uDudu so, I was asking myself if this is a male how do they call him uDudu because that is a female name.

SL Oh you thought of Dudu because it is a common name?

TM Yes, but I never heard the name of Duda.

SL So you were making sure?

TM Yes.

SL But it is very clear that is a male?

TM Yes because immediately they said *umfowabo*

SL So all that previous knowledge of red bricks about the school, it brings it right back so that it actually shapes your understanding of the text. Isn't that an amazing example?

ML Yes it is, and it makes me keep jumping like this, forward and you want to go back a little bit just to confirm - what you are thinking is true or not.

Implications for educators

Some of the strategies described by these readers are known to be effective in reading across languages; in fact they exemplify some of the reading activities recommended by the Department of Education in its National Curriculum Statement: Curriculum and Assessment Policy Statement (Department of Education, 2011). These include:

- pausing to check comprehension,
- comparing content to expectations,
- visualising what is being read,
- relating what is read to background knowledge, and reflecting on what is read.

Other strategies that might apply more particularly to the orthography of isiZulu are:

- consciously reconstructing speech sounds as a small grain size processing strategy for complex words, in a process that could be seen as a high speed internal version of 'sounding out',
- being alert to morphemes that modify meaning in agglutinated words, and
- using contextual cues to select the most appropriate among different tonal options of words read.

Analysis of the orthography of isiZulu leads to further considerations that might be helpful to educators.

One is that while the common use of the alphabet by isiZulu and English allows for transfer of learning in reading these languages, there are complications in this common usage. Because of the opacity of English orthography, and the transparency of isiZulu orthography, many letters perform differently in these languages. For example, it would benefit learner readers to know that ‘a’ represents just one speech sound in isiZulu, but can stand for several different vowel sounds in English, that ‘p’ signifies both an aspirated or unaspirated consonant in English (a feature generally below the awareness level of first language English speakers), but must be followed by an ‘h’ to represent the aspirated consonant in isiZulu, that ‘th’ represents completely different sounds in English and isiZulu, and that ‘c’ can be involved in at least four different speech sounds in English, none of which is remotely similar to the click consonant it represents in isiZulu. It would save new readers of English and isiZulu a great deal of bewilderment if teachers were trained to make the differences between use of letters in English and isiZulu explicitly clear. This is mentioned in a handbook for teachers (Department of Education, 2008), but usually it is simply assumed that the differences will be automatically understood by new readers.

Another basic consideration relates to automatic word recognition. As noted above, there is a strong correlation between saccade length and reading rate, implying that automatic recognition is associated with reading proficiency. Sustained practice in recognising high frequency non-agglutinated short words, and high frequency word forms with only two or three morphemes would help learners to gain automatic recognition of high frequency words. Practice could be through the use of flash cards, or scanning newspaper text for target words such as ‘uma’ (if/when) or common morpheme combinations such as ‘abaka-‘ (they have not yet). Linked to this could be exercises in spotting shifts in meaning encoded in shifts in morphemes, perhaps by pairing constructions with subtle differences and encouraging learners to spot one with a particular meaning as quickly as possible. An example of this might be:

owayekuthanda vs *owayengathanda* (who used to like you/it) vs (who did not like to. . .)

ungakhathazeki vs *ungakhathazi* (don’t worry) vs (don’t cause trouble)

Another useful strategy for readers of isiZulu to learn would be to cope with homographs and lack of tonal markers by looking for contextual cues.

For example, the meaning of *Lezi zincwadi zingatshelekwa emtapweni wolwazi*. depends on the tonal pattern: These books can be borrowed from the library OR: These books must not be borrowed from the library).

This necessitates attending to the meaning in surrounding text, and looking for contextual cues, which few teachers appear to be trained to enable their learners to do; observations in local schools and adult classes indicate that while teachers do attempt to ensure that their readers understand the meanings of individual words, they tend not to direct the attention of their learners to the meaning of whole paragraphs, or the overall meaning of a text (Mather, 2013; Sivnarain, 2014). They are by no means alone in the assumption that once readers decode words, their understanding of text will automatically follow; a draft reading development course developed by an internationally recognised reading researcher stops at word recognition (Abadzi, 2014).

Where teachers do attend to the overall meaning, they can take advantage of children's proficiency in their mother tongue, and their familiarity with language features such as concords in identifying referents and inferring information in text.

Conclusion

Data from this study indicates that competent readers of isiZulu do consciously and effectively use particular decoding strategies. These strategies could be incorporated into reading programmes and brought to the awareness of reading teachers, and several considerations might be helpful to teachers working to develop their learners' reading skills.

One is ensuring that readers who are developing reading skills in both English and isiZulu have a full understanding of the differences in the ways that letters of the alphabet are used in the two languages.

Another relates to the strong correlation between automaticity and reading proficiency. Learner readers would benefit from exercises designed to

develop their ability to recognise high frequency non-agglutinated short words and high frequency word forms in the instant that they are seen.

Equally useful would be exercises that stimulated and strengthened learner readers' awareness of shifts in arrangements of morphemes, and the concomitant shifts in meaning.

Finally, coaching readers to find contextual cues would help them to resolve ambiguities and cope with the absence of markers of tone that modify meaning in speech.

In closing, it is useful to note that an unintended consequence of describing useful reading strategies such as those defined above is that diligent educators may forget or not understand that their use is not as ends in themselves, but in reaching the central objective of reading, which is to access the meaning of texts. All the readers who contributed to the compilation of the strategies listed above were very clear that they used these strategies not as ends in themselves but because they had found that their use increased their ability to effectively access the meaning of texts.

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Appendix 1a:

Invitation to participate in the study, including a self test of reading rate

UYAMENYWA UKUBA UZIMBANDAKANYE NOMSEBENZI WOCWANINGO LOKUFUNDA ISIZULU.

Ungakwazi ukufunda lokhu ebhokisini ngaphansi komzuzu owodwa? Zikalele ngewashi:
Uma ungafunda kulelibhokisi isikhathi esingaphansi komzuzu owodwa , kungenzeka

Sidinga ukusebenza ngokushesha ukuthuthukisa izilimi zase Africa enyuvesi yethu. Ukuthuthukiswa kwezilimi zase Africa njengezilimi esiphathelene nemfundo ephakeme kubalulekile. Sonke sidinga ukuzinikela kuzona. Akusiyena uhulumeni kuphela okungafanele abone ukuthi lezilimi zase Africa zisetshenziswa endaweni efanele emphakathini wethu. Ngokweqiniso lokhu kungumsebenzi wethu sonke. Ezikhungweni eziphezulu zemfundo, abathuthukisi bezilimi, kanye nomphakathi wonkana kufanele baqiniseke ukuthi izilimi zase Africa ziqinisekise.

Izilimi zase Africa zibalulekile kulelizwe. Zisivezele ukuthi singobani, futhi sifuna ukuba ngobani, kanye nendlela esifisa ukwakha ngayo i South Africa.

Ukuthuthukiswa kwezilimi zase Africa kwimfundo, nakwezemfundo ephakeme, kusemthethweni sisekelo. Uthi umthethosisekelo, bhekisisani ukushabalala kwesisindo sezilimi zabantu bakithi kuleli, uhulumeni kumele athathe izinyathelo ezingqala zokuphakamisa isisindo nenqubo yokusetshenziswa kwezilimi zethu. Masingavumeli ukuthi izilimi zakulelizwe zishabalale. Kodwa masiziqinisekise.

uthande ukuba ingxenye yocwaningo lomsebenzi wokufunda imibhalo yesiZulu. Indlela okubhalwa ngayo isiZulu kuhluke kakhulu endleleni okubhalwa ngayo isiNgisi. Kanye namakhono okufundwa kwesiZulu awakaqondisiseki namanje.

Ngidinga abantu abakwazi ukufunda isiZulu ngokushesha futhi okulula kubona ukufunda, abangaba nothando lokuvolontiya. Ngidinga ukuqopha indlela amehlo abo anyakaza ngayo uma befunda. Inhloso yami eyokuhlola amakhono okufunda incwadi yesiZulu.

Uma uzinikezela kulomsebenzi ungsiza entuthukisweni yolimi lwesiZulu njengolimi olufundwayo. Bonke abazozinikela kulolucwaningo bayothola ulwazi mayelana namakhono okufunda kwabo.

Ayikho imali ezotholakala ngokwenza lomsebenzi.

Appendix 1b:

English version of the invitation in Appendix 1a
(not used in the study, but included here for clarification)

INVITATION TO PARTICIPATE IN A RESEARCH PROJECT ON READING IN ISIZULU.

Can you read the text in this box in under a minute? Time yourself:

If you can read the text in the box in less than 1 minute, you might be interested in taking part in a research project by having your own reading of Zulu text analysed. The way Zulu is written is very different from the way English is written, and the skills needed to read Zulu text well are not yet well understood.

We need to move speedily in making the development of African languages a reality at our universities. The development of African languages as languages of scholarship is an imperative that we all need to commit ourselves to. It is not for government alone to see to it that African languages get their rightful place in our society, but indeed this is the responsibility for all of us. Academic institutions, language practitioners and broader society should all come on board to ensure that African languages are strengthened at universities and in society as a whole.

African languages constitutes one of our most important [forms of] heritage, about who we are and about who we want to be and the kind of South Africa we wish to build, including the manner which we use our languages.

The development of African languages in education in general and higher education in particular is mandated by the Constitution ... [which] states that, "recognising the historically diminished use and status of the indigenous languages of our people, the state must take practical and positive measures to elevate the status and advance the use of these languages" We should not allow our languages to die, but strengthen them If we are not seeking to develop our languages as practitioners in higher education, then who will?

I am looking for people who read Zulu fast and easily and who would be interested in volunteering to have their eye movements recorded as they read short excerpts from Zulu novels. The purpose of this recording is to discover whether particular patterns of eye movement are common among competent readers of Zulu text.

Participants in this project will be making a significant contribution to research in the development of Zulu as a language of reading and learning, and each participant will receive a summary analysis of their reading skills. **However please note that there will be no payment for participation in the project.**

Appendix 2:

Texts used in this study (though not in this format)

1. Memela, N. (1992). *Sengikhulile*. Durban: New Readers Publishers.

UNomadashimane igama lami. Sengikhulile! Awu! Akukho okudlula lokhu. Ikhulu leminyaka akusiyo into encane. Phela ngazalwa ngempi yamaNgisi namaBhunu. Abanye babewabiza ngokuthi amaDashimane amaBhunu. Igama elithi Nomadashi lasukela lapho. Ubaba wayesebenza epulazini endaweni yase-Bulwer. Kwathi ngokusuka kwempi wathi umlungu kubaba, "Ngiya empini. Hleze ngingabuyi, ngifele khona. Uma ngingabuyanga, ungakhathazeki. Ngiwenzile onke amalungiselelo okuthi umesisi anibeke nezingane zakho." Umama ngalesosikhathi wayekhulelwe. Wazibula ngamawele, umfana nentombazana. Bathi kuzelwe amakhosi. Bangiqamba igama elithi nginguNomkhosi. Kepha ngenxa yokuthi ngazalwa ngempi kwaduma elokuthi nginguNomadashi. Ngakhula-ke sihlezi epulazini. Sasilima, sisenga izinkomo, kudliwa amasi. Kwakujwayelekile ukuthi ingane ekhulele epulazini iwuqale isencane umsebenzi. Ngaqala ukusebenza ngingakalihlanganisi ishumi leminyaka. Umsebenzi wami kwakungowokuphatha izingane zomlungu. Ngaze ngakhula impela ngisebenza kuye lomlungu.

2. Nyembezi, S. (1953). *Ubudoda abukhulelwa*. Pietermaritzburg: Shuter and Shooter Pty Ltd, p.15.

Lapha kwaMsezane kwakwakhiwe ngempela. Kwakungumuzi ovuthiwe. Indlu yayakhiwe ngesitini esibomvu, esishisiwe. Yayinovulande ezinhlangothini ezimbili. Indlu yayinamakamelo ayisishiyagalolunye. Kwakukhona indlu yokuphola, neyokudlela, nalapho ayesebenzela khona uMsezane nalapho ayegcina khona izincwadi zakhe. Phela kwakungumfo owayekuthanda ukufunda. Kunamakamelo amathathu okulala. Bese-ke kuba yikhishi nendlu lapho kubekwa khona ukudla. Uma ungena endlini yokuhlala, wawukhangwa upiyane olukhulu, luzisho nje ukuthi olwemali. Kwakukhona futhi endlini izihlalo ezithofozelayo, ayethi umuntu uma ehlala kuzo ashone phansi avele ngezindlebe. Phakathi nendawo kukhona itafulana elincane kubekwe phezu kwalo isitsha esinezimbali. Phansi lapha amapulange ayembozwe ngocansi lwabeLungu. Kwakuyiloluhlobo othi uma uhamba phezu kwalo nezigi zife, umuntu athashazise okukamangobe. Ezindongeni

kwakulenga izithombe ezimbalwa. Zonke izinto ezazikulomuzi zazikhuluma ngokusobala zithi kukwamnumzane lapha.

3. Mkhize, M. T. (1983). Amahlaya alala insila. Pretoria: De Jager-HAUM Publishers, p.1

Umuzi wakubo kaChithimpi Zondi umfo kaNkalimba wawunezindlu ezimangaqhugwana amathathu wakhiwe ngaphansi kwegquma. Iminyango yezindlu yayibheke ngaseNyakatho ukugwema iziphapho ezazivamise ukuqhamuka ngaseNingizimu. NgaseMpumalanga yomuzi kwakunomhoshana okwakwehla kuwo umchachazwana wamanzi owawuze uyongenela emfuleni uMzimayi. Ntambama kwakuye kuheleze umoya obandayo owawuye ungene ngezi-khadlana zezicabha kwaZondi. Lamahelhelana ayeqala ngokuphola kamnandi kodwa agcine esebanda ngokumangalisayo lapho sekuphakathi kwamabili ebusuku ikakhulukazi uma kusebusika. Ngalelilanga kunguMgqibelo ntambama iwona lamahelhelana ayesiza ekupholiseni kwaZondi. Phela lapha emzini kaNkalimba ngalelilanga kwakusindwe ngobethole kutatazela omakoti kunjeyaya. Okungamakhehla nezalukazi kwakulokhu kubonakala kuphuma kuthi tshobe ngemva kwezindlu kuchitha lawomanzi ayengasadingeki emizimbeni yawo. Kulobuhholoholo bomsindo wabonakala uDuda umfowabo omncane kaNkalimba engena endlini nezimbuzi ezimbili ayezibambe ngezimpondo eyokuma ngasemsamo. Esemamo uDuda wabatshela abasendlini ukuthi lezimbuzi kwabe kungezani.

4. Zama, J. M. (1967). Ingwe idla ngamabala. Pietermaritzburg: Shuter and Shooter, p.1

Kwakungenye intambama lapho selibantubahle; kusentwasahlobo iminduze seyiqalile ukuqhakaza, mhla ngiqalayo ukuyizwa inguquko empilweni yami ngoba ngakhanyelwa kusukela ngaleyo ntambama ukuthi akukho lutho oluzenzekelayo nje ngokwalo. Yonke into emhlabeni inembangela nenhloso ethile kulowo nalowo muntu. Leyontambama engiyisusela kuyo lendaba yami ngayiphawula ngoba ubaba, uNqakamatshe, wafikisana kanye nathi esangweni lomuzi wakwethu, kwazise ukuthi sasingaveli ndawonye nobaba. Ubaba wayebuya embizweni eyayibizwe nguGazi iNkosi yethu thina baThembu. Thina sobathathu madodana akhe sasiqhamuka kokumba iziphunzi esikhaleni esasisivule ezinsukwini ezingaphambiyana ngokugawula izihlahla ekupheleni kwehlathi elaligudla insimu kamame omkhulu, uMaButhelezi. Umame omkhulu wayebike kubaba ukuthi isife ayesilima

minyaka yonke sase sinciphile ububanzi baso ngenxa yokucinaniswa yimixhantela yezihlahlana ezazimila ezimpandeni zemithi eyayisephethelweni lalelohlathi. Thina sasivela kulowo msebenzi.

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