

Linguistic Diversity: A Contributory Factor to Reading Problems in Zambian Schools

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A lack of familiarity with the language of teaching is blamed for illiteracy rates beyond 40% among people who live in nations in Africa or Asia in which dozens of languages are spoken. For a critical test of the importance of familiarity with the language in which initial reading is practiced, we took the Zambian situation as a natural experiment and tested effects of a fit between the local language spoken in the homes and playground and the language officially designated as language of instruction. We selected 12 state-funded primary schools from three districts likely to differ in match between children's language and language of instruction. From each school we took at random 10 high- and 10 low achievers, in all 240 pupils, and tested them after 18 months of instruction. Pupils make more progress in word reading fluency in a Zambian language and English when basic reading skills are practiced in the children's most familiar Zambian language. Research into other facets of reading instruction is required to balance various possibilities for increasing efficacy of reading instruction.

INTRODUCTION

A 1995 study in Zambia conducted under the auspices of SACMEQ (*Southern and Eastern Africa Consortium for Monitoring Educational Quality*) found that only 25% of Grade 6 pupils could read at a minimum level of proficiency and only 3% at a specified desirable level (Ministry of Education 1995). Among several plausible explanations for this catastrophe—lack of reading material at home and in the surroundings, absence of or failing preschool education, scarcity of books, a whole-language method that did not pay systematic attention to phonics, up to 80 pupils per classroom, and loss of teachers because of HIV/AIDS—a major contributory factor to the delay in reading shown by Zambian children was believed to be initial reading in and through English, a language that is unfamiliar to the majority of children (Williams 1993; Kelly 1995; Ministry of Education 1996; Williams and Mchazime 1999; Tambulukani *et al.* 2001; Sampa 2003; Heugh 2006).

To tackle this situation that compromises the quality of education being offered at primary school level in Zambia, a new language policy provides for the introduction of reading in Grade One in a Zambian language (Ministry of Education 1996). The *New Breakthrough To Literacy* approach (NBTL) uses one of seven officially recognized indigenous languages as the

medium of instruction; these are Bemba, Nyanja, Kaonde, Lozi, Lunda, Luvale, and Tonga, which all belong to the Bantu language group (Banda 1998). Geographically proximate languages tend to have similarities (Holden 2002). It is estimated, for example, that the two most used Zambian languages, Bemba and Nyanja, have 47% of their vocabulary in common (Kashoki 1990). There are however many variations even in basic words like *man* [in Bemba and Nyanja: *umwaume* and *mwamuna*], *daughter* [umwanakashi and *mkazi*] and *hands* [amboko and *manja*], as well as in prefixes—the most prominent grammatical characteristic of Bantu languages. It was therefore decided to instruct beginning reading skills in all seven Zambian languages. English remains the medium of instruction in Zambia and a reading course in English—*Step in to English* (SITE)—follows in Grade 2.

Overlap between the language of instruction and children's most familiar language

The Zambian situation lends itself for a natural experiment for testing the importance of teaching in Grade 2 in a familiar language. Despite the fact that reading is taught in a local language, there are grounds to suspect that not all Grade 1 pupils thus have the benefit of being taught in a familiar language. At the behest of the Zambian Ministry of Education, the first author visited various parts of the country in the period that the new language-medium policy was implemented. He observed that there may not be any great overlap between the local Zambian language that is officially designated as the language of instruction in a particular district and the language spoken at home and in the playground. For instance, the standard Nyanja, the official Zambian language used for teaching literacy in Grade 1 in Lusaka, may differ from the language spoken by most Lusaka children. They speak a non-standard variety of Nyanja, 'town Nyanja', characterized by borrowings from English as well as other Zambian languages (Kashoki 1990; Williams 1996). For instance, Lusaka children are more familiar with the 'town Nyanja' term *mabrikisi* (from the English 'bricks', but with Nyanja *ma-* as a plural marker, and Nyanja phonology) rather than the standard *ncherwa*. Or as a child put it: '*when we are told to write, we are given different things, things that are spoken by other people, and not the Nyanja we speak*' (Williams 1998).

To test the benefit of a familiar language the first author selected similar public schools from districts where the overlap between the official language of instruction and the language spoken by the children was expected to vary. He estimated that the overlap in vocabulary would be rather good in Mongu (Western Province) but very poor in Lusaka Province, with Chipata (Eastern Province) scoring in between. In Mongu most pupils are assumed to be familiar with Lozi, the official Zambian language in that place although some children may be more familiar with Mbunda, another local language with a different vocabulary. In Lusaka and Chipata 'standard Nyanja' is the lingua franca of these areas and has therefore been designated as the official language of

teaching. The ‘standard Nyanja’ is said to be based on Malawian Chichewa which is generally regarded as a ‘pure’ or, in the African metaphor, ‘deep’ form of a Bantu language (Kashoki 1990; Kishindo 1990). As argued above there are, however, many discrepancies between the vocabularies of the ‘town Nyanja’ spoken by most Lusaka children and the ‘standard Nyanja’. In the district *Chipata* the Nyanja used in schools also differs from the language spoken in the homes but there may be more overlap in vocabulary between both versions of Nyanja than in Lusaka because of the proximity of Chipata to the districts of Katete and Chadiza where the ‘deep Nyanja’ is spoken both on the streets and in homes. Zambia thus is a suitable candidate for comparisons between pupils differing in familiarity with the language that is officially designated to practice beginning reading skills—a question to our best knowledge not yet studied in Zambia or surrounding countries (Kelly 1995).

Benefits of teaching reading in a familiar language

The literature lends support to the viewpoint that it is easier to relate the phonology of a word to its written form when the word is part of a child’s vocabulary (Tabors *et al.* 2001; Whitehurst and Lonigan 2001). If there indeed are interrelationships among word identification and several measures of oral language as some studies suggest (Bowey and Patel 1988; Bowey 1994; Dickinson *et al.* 2003; NICHD Child Care Research Network 2005) we may expect a higher success rate in acquiring basic knowledge about how to read words when, as in Mongu, children practice a Zambian reading vocabulary that is also part of their oral vocabulary. The success rate will be lower when, as in Lusaka and Chipata, a non-standard variety of the Zambian language that is used for teaching reading is spoken by the children at home and in the playground and there are substantial discrepancies between the oral and written vocabularies and grammatical characteristics. Alternatively, developers of the NBTL approach tend to downplay the potential role of discrepancies between the language of instruction and children’s language as a cause of delays in learning to read. It is assumed that children may easily acquire the Zambian language of instruction considering that Zambian languages have communalities in vocabulary and grammar (Kashoki and Mann 1978).

According to the linguistic interdependence hypothesis (Cummins *et al.* 1984; Cummins and Swain 1986), the new language policy may facilitate learning to read English in Grade 2 (Williams 1998). When the acquisition of reading in English is mediated by the level of reading competence in a Zambian language at the time the child begins to acquire proficiency in reading English, as the linguistic interdependence hypothesis predicts, we may expect that the same factors that benefit learning to read in a Zambian language benefit reading in English. To test the effects of instruction on reading in the Zambian language as well as in English children were tested at the end of Year 2 in which pupils had switched to English as a medium to practice reading, and some proficiency in reading English may be expected at the end of this year.

Our last hypothesis is that familiarity with the language of instruction may become more critical as a factor in explaining reading proficiency across reading development (Snow and Dickinson 1991). After the first stage in which children practice how a small set of word forms relate to the words' pronunciation, the children practice reading new words, which makes a stronger appeal to familiarity with the words' meaning (Evans *et al.* 2000; Sénéchal and LeFevre 2002; Storch and Whitehurst 2002). We expect therefore stronger effects of familiarity with the language of instruction on reading words after the first stage of instruction. To test this hypothesis we compared more and less advanced pupils. In Zambian schools children are taught in homogeneous groups at four levels of instruction conditional upon their progress through the method. To test differential effects of language we included children assigned to the lowest and highest level of proficiency by their teacher.

This study

Apart from the fit between the language of instruction and children's language, teaching in the schools selected for participation in the research was similar in main issues. First of all, insofar as children's language differs from the official language of instruction, teachers use the language that children best understand for telling children what to do, managing the class and introducing new activities.

Secondly, the method of instruction during the first two years is similar. Described in a nutshell, in the first period of Grade 1 pupils practice how to read typical spelling patterns—the open syllables of the type CV (consonant-vowel)—in familiar word forms, for example, /pa/ in papaya, and simultaneously they practice other syllables beginning with the same consonant, for example, pe, pi, po, and pu. Bantu languages typically avoid phonetically more complex consonant clusters, which becomes apparent in words that are imported from English or other non-Bantu languages. For example, in *sukulu* for school *sk-* has been broken up by inserting epenthetic *u's*; *-u* has also been added at the end of the word. After children have thus acquired letter-sound rules they start practicing reading new Zambian words and sentences in the second part of Grade 1. In Grade 2, a shift is made to English using exactly the same words, sentences, and texts as practice materials in all schools.

Thirdly, the literacy environment at schools is very similar. The new literacy approach prescribes that children in their Grade 1 classroom find there a rather rich reading environment with words and sentences on the walls and a class library with about 130 books, all in the Zambian language officially designated as the language of instruction. A similar classroom environment is created in Grade 2, however now with English words on the walls and a class library with books in both the Zambian language and English.

This naturally occurring quasi-experimental situation with reasonably similar instructional and contextual variables permits descriptive and correlational

analysis to assist in establishing effects of familiarity with the language of instruction. In all, the main purposes of the present study were to investigate the following three hypotheses:

- (i) Practicing reading in an indigenous language that differs from the language spoken at home and in the playground interferes with learning to read simple words in a Zambian language, even though the language of instruction and the most familiar language are both Bantu languages that have words and grammar in common.
- (ii) The fit between the language in which reading is practiced in Grade 1 and the Zambian language spoken by children explains much of the heterogeneity in the reading of English words.
- (iii) More advanced readers benefit more from familiarity with the language of instruction than their less advanced peers.

METHOD

Design

The study included schools from three districts, namely Chipata (Eastern province), Lusaka (Lusaka province), and Mongu (Western province). As argued above, there were good reasons to suspect that not all districts/schools were equally successful in providing beginning reading instruction in the children's most familiar language. Testing took place after slightly less than 2 years of instruction, in Grade 1 in reading of the Zambian language and in Grade 2 in reading of English.

Schools

In each of the three districts we selected four state-funded primary schools. There was hardly any choice because we preferred schools that were among the first to teach reading with *New Break Through to Literacy* (NBTL) in Grade 1 and *Step in to English* (SITE) in Grade 2. Each of the selected schools had been using the new approach for six years and all teachers were trained in both methods by attending compulsory courses. The selected schools were all state-funded schools that recruited pupils from a population that is similar in socio-economic status. Half of the schools in Chipata were from urban and half from rural sites, whereas all schools in Lusaka were urban and all schools in Mongu were rural.

Pupils

We randomly selected per school 10 children from the 25% that their teachers had assigned to the most advanced instruction level and 10 from the 25% that had made least progress after 18 months of instruction according to their teachers. Classes in each school have an average of 40–50 pupils and are divided in four ability groups (see also Williams 1996) and children are

taught in these rather homogeneous groups of about 10–15 children at a time. Teachers assign their pupils to one of four levels ranging from advanced to staying behind based on an assessment of children's abilities to read and write words that have been practiced in the first three months. More assessments follow during first grade and in second grade after completing other components of the method. Theoretically children can be upgraded to higher-level groups or down-graded. Upgrading rarely happens because it is almost impossible for children to catch up when they were assigned to a lower-level group at the start. After almost two years of instruction we selected per school 10 pupils from the lowest and 10 from highest levels, resulting in a total of 240 pupils. Most schools had two or three parallel Grade 2 classes. If there were more Grade 2 classes, equal numbers of low- and high-achievers were randomly selected from parallel classes. According to the teachers, all participants were normally developing and had started school aged 7. Forty-three percent were boys. Information on the occupation of the children's principal caretakers was not sought directly from each pupil, since previous research has shown that obtaining data sufficiently precise to provide useful information on their family circumstances would require very time-consuming personal questioning (Williams 1996). According to the teachers, all pupils were from families with a few years of schooling at the most living in poor neighborhoods with a low standard of living. It should be mentioned that children from better-educated families living in more affluent circumstances attend private schools (about 30% of the Zambian school population). Questions about home possessions presented to children in the Lusaka district revealed low standards of living: 30% had a flushing toilet at home, 50% running water, 59% a stove, and 65% electricity. Visits to a few homes in each district confirmed our suspicion that there was hardly any print (e.g. advertisement, calendars, coupons, TV guides, invitations, books, magazines, and newspapers) or other incentives for becoming literate such as paper and pencil and diaries in the pupils' homes (Purcell-Gates 1996). There are no public libraries to provide beginning readers with reading materials at home and hardly any initiatives by schools to stimulate parental involvement in their children's reading development.

Procedure

The first author paid field visits to the three districts: Chipata, Lusaka, and Mongu. All 240 children were tested in one-to-one sessions in the child's classroom. Testing took place within a period of four weeks, with the help of three local research assistants trained and supervised by the first author. Teachers of the children were not involved in testing pupils, though one teacher was always available to help settle children down. Because most Zambian schools do not have spare rooms, testing was done in the classroom while the other children were in the playground or lodged in another classroom. Tests were carried out in the same order in one session of about 30 minutes. As indicator of familiarity with the language of instruction, we asked all

teachers to indicate for which pupils in their classroom the language of teaching was their first language, that is, the language that they used at home and in the playground.

Tests

In addition to an expressive vocabulary test (the Familiar Language Test) two tests assessed word reading fluency, one in the Zambian language of instruction and one in English. We also tested letter knowledge and phonemic awareness but those tests are not reported in this article. An attempt was made to test comprehension of sentences and short texts but this test exceeded most pupils' (about 80%) reading skills as shown by their inability to match the sentences with the correct depiction. As there were no standard language and reading tests currently available it was necessary to devise tests that had *prima facie* claims to be valid.

Familiar Language Test

The child was asked to name objects and actions on a picture depicting common objects—like water, people, and dress—and actions—like swimming and buying. The illustrations showed four settings: women and children in a canal, women at a market stall, children playing with cars, and women ironing clothes. Children were asked to name what they saw on the illustration in a Zambian language. The researcher noted how many words were named in the Zambian language used for teaching, that is, Nyanja in Lusaka and Chipata, and Lozi in Mongu, and how many words in another Zambian language that is common in the district, that is, town Nyanja in Lusaka and Chipata, and Mbunda in Mongu. To make scoring easier the researcher disposed of two lists of often named words, one in the language of teaching and one in the other local Zambian language; see [Table 1](#). From the 20 listed words only *makonde* [bananas] is the same word in Lozi and Mbunda, all other words differ. A similar list was available for Nyanja and town Nyanja. When children named other words than those included in the list of 20 words these responses were scored as well. In all, children had five minutes to complete the task. When children did not respond after one minute a research assistant pointed to an object and encouraged the child to name it. Intra-class correlations between two assistants scoring 20 children on the language of teaching and the other local language were 0.85 and 0.89, respectively. As an indicator of children's familiarity with the language of instruction we calculated the percentage of responses in the language of instruction. For instance, when a child named eight words in total, of which one was in the Zambian language of instruction and seven in the other local language, the score was 11%. We thus created an indicator of familiarity with the language of teaching that was unaffected by the total number of responses.

Table 1: Lists of objects and actions in the Familiar Language Test

	Lozi	Mbunda	English
1	mezi	mema	water
2	nuka	ndonga	canal
3	masheleni	bimbongo	money
4	kubapala	kweha	playing
5	kuhaina	kubyana	ironing/pressing
6	kuka mezi	kuteka mema	drawing water
7	ndondo	nongo	clay pot
8	mupusi	lipusi	pumpkins
9	makonde	makonde	bananas
10	batu	banu	people
11	banana	banike	children
12	musima wamalabishi	china	dust bin
13	sapalo	vizalo	dress
14	hembe	chizalo	shirt
15	mbututu	keemba	baby
16	tafule	tebulu	table
17	simbi/haini	shimbi	iron
18	kutabela	kuwanilila	happy
19	lihauloo	windo	window
20	tali	chikuko	baby sling

One minute of reading Zambian words

Pupils were asked to read as many words as possible from a list of 60 words derived from the reading method during one minute. The first 30 words were one- or two-syllable words (e.g. in Lozi: *va, boma, coko, luna*) and words farther down were three-syllable words (e.g. in Lozi: *tabela, litino, sikolo*). From a pilot study it appeared that some children kept trying the same word resulting in low scores. We therefore developed a procedure in which the examiner assisted the child by running a ruler down the card from word to word. If the child had not made any attempt after 10 seconds the examiner skipped the word. When the child did not attempt to read the examiner encouraged the child to give it a try. If a child had not started to read after three minutes, the examiner broke off the test. Each word was awarded one point. Cronbach $\alpha = 0.75$.

One minute of reading English words

A similar list was derived from the English practice materials and tested likewise. The first 25 words were two- or three-letter words (e.g. *cat, pot, eat, sit*)

followed by disyllabic words (e.g. *like, water, teacher*). The procedure was similar to the procedure for Zambian words. Cronbach $\alpha=0.81$.

Teacher Interview

Teachers were interviewed about the living circumstances of their pupils. Furthermore they were asked to indicate for each of the participants whether the language in which reading is practiced is the child's first language (L1) or a second language for the pupil (L2).

Data analysis

We conducted multiple regression analyses on word reading measures in the Zambian language and in English to test the effect of practicing reading in a familiar language. As students were grouped within schools it was necessary to first inspect the random effects of schools (the intraclass correlation coefficient) and, insofar there were school-level effects, to make an attempt to account for some of the variation attributable to school-level characteristics (Luke 2004). We entered the schools' mean on the Familiar Language Test and urban versus rural as school-level variables that might explain differences between schools. Finally we introduced student-level covariates: gender, whether the child is a high- or low achiever according to the teacher, and is strong or weak in the language of instruction compared with the classmates. As an additional check of effects of familiarity with the language of instruction, a second set of multiple regressions was conducted with L1 versus L2 classification by the teacher as predictor instead of the Familiar Language Test.

RESULTS

Data description

On average children scored 9.71 words ($SD = 3.99$) on the Familiar Language Test. A minority scored 4 or lower (11%) or over 16 (6%). When this test is a valid indicator of children's familiarity with the language of instruction we may expect higher or lower scores when pupils were classified as L1 or L2 by their teachers, respectively. This was indeed the case, $t = 13.40$, $df = 238$, $p < 0.000$. Average percentages of words in the language of instruction for pupils classified by their teacher as L1 and L2 were 90.75% ($SD = 16.06$) and 30.18% ($SD = 34.18$), respectively.

Table 2 shows that schools in Lusaka had the lowest scores on the Familiar Language Test with means ranging from 6% to 9%, indicating that pupils were more familiar with the vocabulary of another local language than with the vocabulary used in the reading method. By contrast, the schools in Mongu had the highest scores ranging from 90% to 100%, indicating that pupils at these schools were familiar with the language of teaching. The scores of Chipata schools laid between those of the Lusaka and Mongu schools (14–55%),

Table 2: Mean scores per school on language measures and word reading tests (SD in parentheses)

District	School	Location	Percentage of L1 children according to teacher	Percentage of responses in language of instruction (FLT)	Reading Zambian words (max = 60)	Reading English words (max = 60)
Lusaka	Chit	Urban	20	9 (08)	3.60 (5.42)	4.90 (3.96)
	Kaba	Urban	5	6 (10)	1.55 (3.55)	0.85 (2.89)
	Chin	Urban	0	7 (08)	5.30 (6.83)	6.25 (7.25)
	StLa	Urban	0	6 (10)	2.55 (3.75)	4.90 (3.89)
Chipata	Chan	Urban	0	43 (30)	4.40 (6.43)	4.85 (6.12)
	Maku	Urban	0	14 (09)	4.25 (5.44)	1.75 (3.04)
	Chip	Rural	25	48 (24)	6.85 (8.70)	6.10 (6.93)
	Kazi	Rural	0	55 (30)	2.20 (4.26)	1.15 (2.39)
Mongu	Imwi	Rural	50	90 (31)	13.10 (11.27)	9.65 (10.33)
	Mupa	Rural	100	100 (00)	11.05 (12.46)	7.55 (7.74)
	Kala	Rural	85	100 (00)	13.95 (10.63)	7.30 (7.53)
	Mula	Rural	70	100 (00)	29.00 (16.20)	22.45 (14.53)

FLT=Familiar Language Test.

thus supporting our assumption that there would be some overlap between the vocabulary of the Nyanja spoken by the children in Chipata and standard Nyanja, due to the fact that Chipata is close to places where the deep Nyanja is spoken on the street and in the homes. Likewise, teachers classified pupils in Mongu as L1 whereas in Lusaka and Chipata pupils were mainly classified as L2.

With 10 out of 12 schools scoring on average between two and five words per minute, pupils scored on the low end of the Zambian and English reading tests despite almost two years of reading instruction. As mean scores in Table 2 demonstrate, schools in Mongu by far outperformed those in Lusaka and Chipata.

As can be derived from Table 3, low- and high achievers did not differ with respect to familiarity with language of instruction and percentage L1. The latter is not surprising when we take into account that schools were rather homogeneous in language. However, low- and high achievers differed strongly in reading proficiency. High achievers outperformed low achievers in the number of Zambian ($z = -7.51$, $p < 0.001$) and English words read per minute ($z = -8.62$, $p < 0.001$). Because tests were not normally distributed, especially in the low achieving group, we used a non-parametric test (Mann-Whitney) for statistical testing. On average, more than half of the low achievers (54%) were unable to complete any item while zero scores were rare (about 15%)

Table 3: Mean scores per achievement level (SD in parentheses)

	All pupils <i>n</i> = 240	Low-level pupils <i>n</i> = 120	High-level pupils <i>n</i> = 120
Percentage of L1 children according to teachers	0.30 (0.46)	0.30 (0.46)	0.29 (0.46)
Percentage of responses in language of instruction (FLT)	0.48 (0.42)	0.47 (0.42)	0.50 (0.42)
Number of Zambian words read per minute ^a	8.15 (11.39)	3.02 (6.12)	13.28 (13.04)
Number of English words read per minute ^a	6.48 (8.98)	2.16 (4.07)	10.79 (10.37)

^aMaximum score = 60.

among high achievers. In addition, on inspecting mean scores per school, we noticed that there was substantial variety in the group of high achievers whereas low achievers scored in the same range of very low scores no matter which school. There were no gender differences across achievement groups.

Multiple regression analyses

Log transformations were carried out on the reading tests. As a result, reading Zambian words (skewness: 0.34, kurtosis: -1.31) and English words (skewness: 0.28, kurtosis: -1.27) were normally distributed, consistent with the requirements of multiple regression analysis. By inspecting residuals, the adequacy of a multilevel model was tested (Luke 2004). The level-1 errors were independent and normally distributed with a mean of zero; and the random effects were normally distributed with a mean of zero, and were independent across schools. So, the underlying assumptions of a multilevel model were satisfactory.

School-level effects on the reading of Zambian words

The variance components of Model 1 in Table 4 suggest statistically significant variability at the between-school and within-school level, respectively ($\tau_{00} = 0.09$ and $\sigma^2 = 0.22$). The intraclass correlation, equal to $[0.09 / (0.09 + 0.22)]$ 0.29, suggests that slightly less than one-third of the differences in reading Zambian words was attributable to school traits. To test whether children's average familiarity with the language of instruction could explain this school effect, school means on the Familiar Language Test were added to the model as a school-level covariate. Urban or rural was entered as another school-level covariate. The results, displayed in the second column of Table 4, show that familiarity with the language of instruction significantly affected the pupils' scores. Schools with a good match between the language in which reading is practiced and children's language scored, on average, slightly

Table 4: Fixed and random effects in the reading of Zambian words after 18 months of instruction

	Model 1	Model 2	Model 3
Fixed effects			
Intercept γ_{00}	0.62 (0.09)***	0.32 (0.09)**	0.17 (0.10)
FL (school mean) ^a γ_{01}		0.62 (0.15)***	0.36 (0.15)*
(Achievement) Level γ_{10}			0.30 (0.07)***
Level \times FL (school mean) γ_{11}			0.50 (0.12)***
Individual deviation from school mean on FL γ_{02}			0.18 (0.21)
Level \times Individual deviation (FL) γ_{12}			0.37 (0.33)
Random effects			
Intercept τ_{00}	0.09 (0.04)*	0.03 (0.02)	0.03 (0.02)*
Individual deviation from school mean on FL τ_{11}			0.03 (0.04)
Residual σ^2	0.22 (0.02)***	0.22 (0.02)***	0.13 (0.02)***
Model fit statistics			
-2 log Likelihood	344.23	333.40	206.73
AIC	350.23	341.40	226.73
BIC	360.68	355.33	261.54

^aSchool means on the Familiar Language Test.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

more than 1 SD (0.62/0.56) higher than schools with a poor fit. We dropped the second covariate, namely whether the school is urban or rural, because this covariate did not explain additional variation beyond familiarity with the language of instruction. The variance component corresponding to the random intercept decreased from 0.09 to 0.03 (a reduction of 67%), demonstrating that the inclusion of school means on the Familiar Language Test explained much of the variation between schools.

Effects of pupil-level covariates on the reading of Zambian words

The third column of Table 4 presents the results from the final analysis in which individual- and school-level covariates were simultaneously added to the hierarchical model. Individual-level variables were: whether children were assigned to the high- or low achievers by their teacher, gender, and individual deviation from school mean on the Familiar Language Test (school-mean centered scores). The latter was assessed by calculating individual deviations from school means on the Familiar Language Test. By entering individual-level variables, the fit of the model improved. Clearly, the final model was significantly superior to Model 2 including only school-level predictors; $\chi^2 = 126.67$ (333.4–206.73) with (10–4) 6 degrees of freedom.

Gender was dropped because this covariate did not explain variation. However, high achievers scored on average slightly less than 1 SD (0.30/0.56) higher than low achievers. School mean for Familiar Language Test continued to cause a main effect when individual-level variables were added; schools with the best average fit between language in which reading is practiced and Zambian language spoken by children scored 0.64 SD (0.36/0.56) higher than schools with a poor fit. The cross-level interaction of school means on the Familiar Language Test and children's achievement level was also statistically significant, meaning that familiarity with the language of instruction was an extra incentive for high achievers. In Mongu where mean scores on the Familiar Language Test were highest (90% or above), high achievers scored on average 1.33 SD beyond low achievers $\{[0.30+(0.50 \cdot 0.90)]/0.56\}$. In Lusaka schools with the lowest average score on the Familiar Language Test, the difference amounted to 0.59 SD $\{[0.30+(0.50 \cdot 0.07)]/0.56\}$ which is much less than in Mongu. The model did not further improve by adding an individual-level language covariate, that is, individual deviations around the school mean on the Familiar Language Test, meaning that linguistic variety within classes was limited.

By including all individual-level predictors the predictive ability of the model improved by approximately 83% ($R^2 = 1 - \frac{0.03+0.03}{0.22+0.13} = 1 - 0.17 = 0.83$). The variance component for the random intercept was significant ($\tau_{00} = 0.03$), suggesting that there was still variation in average school performance that was not accounted for by the school-level variables in the model. The significant residual ($\sigma^2 = 0.13$) indicated that there were individual differences among pupils within schools even after accounting for all effects.

Effects of L1 or L2 classifications on the reading of Zambian words

When we entered teachers' categorization as L1 or L2, instead of pupils' scores on the Familiar Language Test while all other variables were the same as in the regression model presented above, the regression model revealed on the whole a very similar pattern of outcomes.

Predicting reading words in English

Analyses with reading words in English as dependent measure revealed very similar outcomes. Twenty-six percent of the variance in reading English words was attributable to school traits. Schools with a good fit between language in which reading is practiced in Grade 1 and the Zambian language spoken by children scored, on average, slightly less than 1 SD (0.38/0.52 = 0.9) higher than schools with a poor fit. Furthermore, a good fit between language in which reading is practiced in Grade 1 and the Zambian language spoken by children enlarged individual differences within schools. In schools with the best average language fit, high achievers scored $\{[0.32+(0.50/0.90)]/0.52\}$ 1.48 SD higher than low achievers whereas the difference was much smaller

Table 5: Fixed and random effects in the reading of English words after 18 months of instruction

	Model 1	Model 2	Model 3
Fixed effects			
Intercept γ_{00}	0.58 (0.08)***	0.39 (0.11)**	0.22 (0.12)
FL (school mean) ^a γ_{01}		0.38 (0.17)*	0.15 (0.18)
(Achievement) Level γ_{10}			0.32 (0.07)***
Level \times FL (school mean) γ_{11}			0.50 (0.11)***
Individual deviation from school mean on FL γ_{02}			0.10 (0.17)
Level \times Individual deviation (FL) γ_{12}			0.79 (0.29)**
Random effects			
Intercept τ_{00}	0.07 (0.03)*	0.05 (0.01)*	0.05 (0.03)
Individual deviation from school mean on FL τ_{11}			0.01 (0.00)
Residual σ^2	0.20 (0.02)***	0.20 (0.02)***	0.10 (0.01)***
Model fit statistics			
-2 log likelihood	316.20	312.08	147.43
AIC	322.20	320.08	167.43
BIC	332.64	334.00	202.23

^aSchool means on the Familiar Language Test.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

in classes with the poorest language fit $\{[0.32+(0.50/0.07)]/0.52 = 0.67$ SD}. When pupils scored beyond the classroom mean on the Familiar Language Test the score of high achievers on the English words further improved as is indicated by a significant interaction between achievement level and individual deviation. By including all individual-level predictors the predictive ability of the model improved by approximately 77%. The significant residual ($\sigma^2 = 0.06$) indicated that not all differences among pupils within schools were explained after accounting for all effects. Entering teachers' classifications as L1 or L2—instead of scores on the Familiar Language Test—revealed a similar pattern of results.

DISCUSSION

The present research supports the hypothesis that a better fit between children's most familiar Zambian language and the Zambian language in which basic reading skills are practiced leads to better reading skills in the Zambian language. Pupils from schools with the best average fit score slightly more than 1 SD ($0.62/0.56 = 1.11$) higher on reading Zambian words than pupils from

schools with the poorest average fit. The results thus corroborate the theory that easy access to the meaning and phonology of Zambian words appears to be crucial for acquiring basic reading skills in a Zambian language which is in line with the literature on reading (Dickinson *et al.* 2003; NICHD Child Care Research Network 2005). Other differences, such as instruction and assignments given in an unfamiliar language, are less plausible as an explanation for delays. Teachers seem to make use of the Zambian language that is most familiar to their pupils for telling them what to do, managing the class and introducing new activities.

Practicing reading in a familiar Zambian language is also an incentive for learning to read in English probably because a better understanding of the relationship between spelling and phonology in the Zambian language as a result of learning in a familiar language facilitates learning to read in English. Pupils from schools with the best average fit between language in which reading is practiced in Grade 1 and the Zambian language spoken by children scored (0.38/0.52) 0.73 SD higher on English words than pupils from schools with a poor fit. Results thus corroborate the linguistic interdependence hypothesis predicting that the acquisition of reading in L2 is mediated by the level of L1 competence at the time the child starts to practice reading in L2.

From comparisons of low- and high achievers appears that familiarity with the language in which reading skills are practiced grows in importance as children become more proficient in reading. In schools with an on average higher score on reading tests, the difference between low- and high achievers amounts to about 1.5 SD for reading in the Zambian language and in English whereas the differences are less dramatic—slightly more than 0.5 SD—when children are taught in an unfamiliar Zambian language. This indicates that, in particular after children have learned how to read words by applying letter-sound rules, familiarity with the language in which reading is practiced facilitates word reading and speeds up reading development (Evans *et al.* 2000; Sénéchal and LeFevre 2002; Storch and Whitehurst 2002).

Success of the local language-medium policy

As the first author anticipated, the local language-medium policy is successful in Mongu but not in Lusaka and Chipata. In four schools in Mongu, pupils were familiar with Lozi—the language of instruction: They preferred Lozi to Mbunda when they named details in a picture and teachers classified them as Lozi users. Pupils from the Lusaka schools, on the other hand were not familiar with the language in which they practice reading as is indicated by their preference for words from ‘town Nyanja’ and their classification by the teacher. The Nyanja spoken on the street and at home in Lusaka is inconsistent with the ‘standard Nyanja’ in the reading method. According to their teachers, Chipata pupils also preferred ‘town Nyanja’ to ‘standard Nyanja’. They scored somewhat higher on the Familiar Language Test than Lusaka pupils, in line with the hypothesis that the local language spoken in Chipata in the homes

and on the street has some similarity with the Nyanja used for teaching basic reading skills. Overall the findings support the impression that the language designated as the official language in a district may not dominate in the homes and on the street. As reading is taught in the official language in Grade 1, many Zambian pupils in Chipata and Mongu practice reading skills with words of which the sound and meaning are less familiar.

The current findings contradict the assumption that Zambian children easily switch from a vernacular language to the official local Zambian language that is used for instruction. Even though there is some overlap between pupils' vocabularies and the language of instruction in most Chipata schools, children experience serious problems with reading as the low scores of Chipata pupils on the reading tests indicate. Extension of the period in which reading is practiced in the Zambian language with two to four years, as occurs in some neighboring countries, might increase the success rate of the Zambian language-medium policy because children then have more chance to become familiar with the Zambian language of instruction, however so far there is no empirical evidence that a longer period guarantees greater success for the local language-medium policy.

Low achievers

Half of the 25% lowest performing children score only zero to two words on the reading tests even when they are familiar with the language of instruction. A genetic disposition for dyslexia, that is, serious problems in acquiring alphabetic knowledge, may be true for a minority but not for all pupils with a delay. Considering the shallow orthography of Zambian languages, it is not very plausible that more than 5% has severe reading impairment caused by phoneme processing deficits (Paulesu *et al.* 2001). A more plausible explanation could be that the NBTL approach does not provide sufficient practice in basic reading skills or that teachers do not succeed to implement the method. Even though the method prescribes training in phonics, actual pedagogic practices may be insufficient to promote all children's understanding of letter-sound relationships and this may explain severe delays in reading. The NBTL approach reserves extra time per week for the lowest achieving pupils but teachers may, for several reasons, not succeed in realizing additional training in groups that lag behind (Miles 2009). Future research should explore these explanations for reading delays by documenting the quality and duration of training in basic reading skills as realized for low- and high achievers.

Limitations

In two ways the design was unbalanced. First of all, familiarity with the language in which reading was practiced was confounded with the Zambian language of instruction. All schools characterized by a relatively poor language fit taught their pupils in Nyanja whereas schools with the best fit taught in

Lozi. It is not very plausible that any differences in reading proficiency have emerged from differences in spelling. In both Lozi and Nyanja, connections between letters and sounds are symmetrically consistent at letter-phoneme level, that is, each letter represents only one phoneme and each phoneme is represented by only one letter (Kashoki 1990). However, as the better fit between children's language and the language of instruction is concentrated in schools in Mongu we cannot rule out that other aspects of the culture, typical for schools in Mongu, offer an explanation as to why these schools outperform schools in Lusaka and Chipata. As we did not collect information on family circumstances and pedagogical practices, other differences than familiarity with the Zambian language in which reading is practiced may explain the contrast between Mongu and the other two districts. However, there are no obvious reasons for assuming such differences between Mongu and the other districts.

Secondly, the design is unbalanced because we tested children assigned by their teachers to the lowest- and highest achieving 25% but not to the group in between these extremes. To get a better impression of the range of scores and the numbers of pupils that lag behind, the middle group should be included in further research.

Furthermore, we made assumptions about the method and environment without further documentation. Future studies should document the quality of reading instruction and the match between children's language and the language used by the teacher for explanations and assignments, thus assessing the quality of teaching. Likewise more documenting of the home environment is advisable. Even though visits to homes in each district confirmed our suspicion that there is hardly any print available, future studies would do well to explore more the language of print used by family members and in the environment.

Finally, the number of schools involved in this study was rather small for a multilevel approach, and results of multilevel analysis can be improved by including more schools and more pupils per school (Bickel 2007).

Afterword

The results showed that the new language-medium policy in Zambia falls short of expectations. Not only is progress in the reading of English rather weak but progress in reading of a local language is as well. The majority's reading ability does not enable them to comprehend simple written sentences in a Zambian language even though they have been exposed to 18 months of reading instruction. The average score of 8.15 Zambian words per minute is low compared with reading proficiency of children in countries with an equally transparent orthography after the same period of instruction (Patel *et al.* 2004). For instance, Dutch children read about 30 Dutch words per minute after 18 months of instruction. However, comparisons with Western countries do not hold due to high absence rates, ill-health and other problems of

Zambian schools, so comparisons with neighboring countries are far preferable but relevant data are still missing.

In the pursuit of ways to improve reading instruction in multilingual countries such as Zambia, it is tempting to exclusively blame learning to read in a language that differs from what constitutes the home and playground language of the students as the major cause of a low success rate in learning to read. The present research confirms that reading proficiency is substantially improved when there is a close fit between the students' home language and an indigenous language serving as a medium of instruction. We may therefore expect that a large number of the 1.25 billion people all over the world who live in a complex multilingual environment run a greater risk of not being able to take optimal advantage of reading instruction. Simultaneously, our findings show that there is no easy solution as many Zambian primary school children are not in a position to benefit educationally from the local language-medium policy as currently implemented (Akinnaso 1994). Despite the language-medium policy, most Zambian children are not instructed in their most familiar language. Extension of the period in which reading is practiced in the Zambian language is suggested as one possible answer to the present deadlock because children then have more time to familiarize with the indigenous language that is used for instruction. There is evidence however that, in addition to the language issue, other facets of reading instruction explain delays in learning to read but a broader analysis that considers all facets simultaneously has not yet been conducted. Especially our findings concerning low achievers suggest that apart from unfamiliarity with the language of instruction, the quality of phonics training and probably also the teachers' ability to apply phonics instruction may contribute substantially to pupils' success rate. To find a lead for further improvement of Zambian reading instruction, we need to balance the various possibilities for enhancing instruction and select the most promising and practical innovations.

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