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Butterfly effects in reading? The relationship between decoding and comprehension in Grade 6 high poverty schools

A B S T R A C T Using the metaphor of butterfly effects, this paper considers how literacy inequalities in comprehension performance amongst Grade 6 learners in high poverty schools can be linked to skills that should have been developed in earlier stages of reading development. The reading comprehension skills of Grade 6 learners in the home language, Northern Sotho, and in English in two disadvantaged primary schools were assessed over a 2-year period, using large group pen-and-paper tests. A smaller sample of learners were then also tested individually for decoding skills each year to see if decoding competence could shed light on the comprehension levels and differential reading effects amongst learners. Strong correlations were found between three measures of decoding skill and reading comprehension. Oral reading fluency emerged as a strong predictor of comprehension. The pedagogical implications of these findings for early reading instruction in South African classrooms are briefly discussed.

Key words: Grade 6 reading, decoding, comprehension, academic literacy, high poverty schools

1. Introduction

The special edition of this journal is honouring the work of Albert Weideman, a South African scholar who has long been associated with Applied Linguistics in general and with academic literacy in particular. He is well known for his meticulous scrutiny in the domain of academic literacy, particularly the development of fair, valid, reliable and transparent forms of assessment of academic literacy that he spearheaded in the South African higher education context (e.g. Weideman 2003, 2006, 2007, 2011; Van Dijk & Weideman 2004; Van der Slik & Weideman 2009). For Weideman a consistent concern has been not only

for the theoretical defensibility of high-stakes assessment tools but also for "their social transparency and public accountability" (Weideman 2011:111). We owe much to Weideman and his colleagues for our current awareness of issues pertaining to academic literacy in South African tertiary institutions. What is less well known is how academic literacy develops in our primary schools and how general issues of transparency and accountability play out in the education sector in terms of literacy inequalities.

In a paper presented in 1970, Edward Lorenz, in describing the mathematical models he applied to the study of meteorology, used the poetic image of the flapping of butterfly wings to show how small changes in the atmosphere in, say, South America, could later set powerful forces in motion such as a hurricane in North America. While Lorenz actually used this image to show how complex and essentially unpredictable weather patterns are, in popular imagination the metaphor has been used to show how an initial small change can bring about a causal chain of events (Dizikes 2008). The term 'butterfly effect' has since been used to refer to a "sensitive dependence on initial conditions", such that a change in an initial state may lead to larger differences in a later state (Scholarpedia 2011). It is in this latter sense that the metaphor is used in this article.

Literacy inequalities abound on the African continent and in our own education system with its many disadvantaged schools. Research worldwide shows that it is not easy to educate poor children largely because of the barriers to learning that poverty imposes (e.g. Abadzi 2006; Bhattacharya 2010). Poverty, poor schooling, low literacy levels and unemployment tend to go hand in hand. Although there are no easy solutions to the challenges that high poverty schools face, understanding the developmental trajectory of reading as a precursor to the development of academic literacy can help to illuminate the origins of literacy inequality within the formal educational sector and so inform the debates around social redress, justice, transparency, accountability and equitable education.

Between 2005-2009 a reading intervention project was implemented in two high poverty primary schools in a township in Gauteng. The annual reading tests that were administered at these schools during the project period highlighted the problems that many of the older learners manifested in understanding the texts that they were expected to read and which put them at risk of academic underperformance or downright failure. Many learners continued to struggle making sense of their texts despite attempts to improve reading comprehension (cf. Pretorius & Lephalala 2011). Could these difficulties be dependent on initial conditions?

This paper uses the metaphor of butterfly effects to examine the possible dependence of later academic skills on earlier reading states. Data are presented of the differential comprehension performance in Northern Sotho and English of Grade 6 learners over a period of two years in order to provide a broad sketch of reading ability in these schools. A smaller sample of learners within these cohorts was also tested for decoding skills, which were then compared to their comprehension performance. These findings are used to ponder the 'initial conditions' needed for the 'later state' of academic literacy to develop so that learners are not vulnerable to academic failure.

2. Interpersonal language competence, reading and academic literacy

The kind of language competence typically needed in the schooling context for learning new subjects and acquiring new knowledge is termed academic literacy or academic competence (Saville-Troike 2006) or, to use Cummins' term (1979, 2000), cognitive academic language proficiency (CALP), which is different from the interpersonal language competence needed for face-to-face interactions with other people (which Cummins referred to as basic interpersonal communicative skills). This is equally true for people who use their primary language or an additional language (henceforth for convenience referred to as L1 and L2 respectively). As Saville-Troike (2006:136) points out, reading (and writing) are more important for academic needs, while speaking is more important for interpersonal purposes. Since interpersonal and academic competence serve different purposes, they draw on different domains of vocabulary, linguistic structures, conventions and comprehension strategies.

Interpersonal language competence is used in everyday communicative encounters and is considered to be context-embedded: it contains many deictic items whose meaning can be recovered from the interactional context and it makes use of paralinguistic features to convey meaning. The locus of meaning is in the interaction itself.

Academic language competence, on the other hand, involves use of a more context-reduced language associated with written language. The locus of meaning shifts to the text itself, and the ability to construct meaning relies largely on the linguistic and textual cues in the written text and in the conventions associated with its use. While written language is not context-free, meaning is built into a text to a greater extent than is the case in oral discourse. This means that readers have to learn how to utilise language and text cues to construct meaning during reading. Constant and extensive exposure to print-based material familiarises readers with the linguistic and textual features of written language as well as with the conventions of different types of text genres. Through exposure, practice and explicit instruction they learn how to construct meaning from the text itself.

There are also significant differences in the statistical distribution of words that occur in oral and written language. Interpersonal language competence in English relies on knowledge of a relatively small number of 2,000-3,000 high frequency words in English while written discourse requires a much larger vocabulary repertoire and contains many low frequency words, general academic words and technical words of specialist subjects (e.g. Nation & Waring 1997). There is a progressive increase in the occurrence of these low frequency words in school textbooks, as well as an increase in the general scientific (or academic) vocabulary used in the learning context.

Reading is the bridge between interpersonal language competence and the development of academic literacy. By the time they start school children have acquired basic interpersonal language competence in their L1. Through reading and writing they then learn how this basic language knowledge is represented in written language, they expand their linguistic base and they also start acquiring academic language competence when they are exposed to written forms of language, in the L1 and/or the L2. In other words, they learn the written code and then by using the code they learn how to access texts and construct meaning via a range of increasingly more complex narrative and expository texts as they move up the educational

ladder. Obviously it is easier for learners to develop academic competence in their L1 since they have a wide repertoire of linguistic knowledge to draw upon, unlike learners who develop this competence in an L2 since, especially in the initial and intermediate stages, their L2 competence may be far more restricted.

In developing tests of academic literacy for use in higher education, Weideman (2006; 2011) defined this construct with reference to 10 aspects of knowledge or skill that characterise a person as being academically literate. These include, inter alia, the ability to understand relations between different parts of a text; interpret different genres of text; interpret graphic information in texts; distinguish primary from secondary information, perceive cause and effect; perceive sequence and order; make inferences; and make meaning beyond the sentence level (cf. Weideman 2011 for further elaboration). What is clear from these characteristics is that it is the ability to access and understand information from *written sources* rather than oral sources that accounts for success in the formal learning context.

The 21st century is described as a knowledge economy, and the rich sources of declarative knowledge to which students need access in order to learn content subjects are expressed via written forms of language, whether in print or electronic form. Academic literacy, whether in an L1 or an L2, goes further than interpersonal language competence and can only properly develop with constant exposure to and use of reading and writing. At what stage in reading development does the flapping of a butterfly's wings make a difference to the development of academic literacy?

3. The development of reading and academic literacy

In all writing systems language is represented at a sublexical level by a series of symbols or codes. In alphabetic writing systems, such as those used by all official languages in South Africa, these symbols represent the sounds of the language, hence the code has a phonological basis. A distinction is thus commonly made between decoding and comprehension, with the former referring to the skills required in learning and manipulating the code and 'translating' the symbols into words in a text. Comprehension refers to the overall meaning assigned to a text. McGuiness (2004: 213) defines it as the ability to locate relevant information in a text and use it to interpret meaning. Decoding involves lower-level processing and it is important for this to be accurately and automatically executed (e.g. Koda 1992) so as to enable comprehension.

In her model of reading development Chall (1983; Chall, Jacobs & Baldwin 1990) charts the differential development of reading skills and the qualitative changes that occur from 'learning to read' to 'reading to learn'. Because the type and function of texts that are read in the learning context change as the reader develops, the kind of 'meaning making' required for understanding and learning from texts changes over time. As children progress through school, texts contain less familiar words not encountered in everyday language, they contain longer and more complex sentences, and conceptually the texts become more dense and complex, with topics and language becoming more abstract.

In the early stages of 'learning to read' children learn the alphabetic principle, letter-sound relationships, recognise high frequency words, and read simple texts containing language and thought processes within their frame of reference. Alphabetic and phonological knowledge

are used to blend sounds and 'sound out' new words that are encountered in the texts. In Grades 2 and 3 decoding skills are strengthened and the reading of simple language becomes more automatised, accurate and fluent. There is a move away from atomistic, word-by-word processing of text to a more holistic integration of information.

A major transition occurs around 10-11 years when reading becomes a tool for learning. Texts start going "beyond what the readers already know, linguistically and cognitively" (Chall et al. 1990:14) and expository or information texts form the basis of learning new knowledge. Learners' language, knowledge, vocabulary need to expand, as does their ability to integrate information and to think critically. By Grade 4 children start developing comprehension strategies that "enable them to concentrate more on focal than peripheral information, to select main ideas for further elaboration, to connect ideas to form a global understanding of the intended meaning of a text, and to retain the information effectively for later recall" (Vauras et al. 1994:362). Learning strategies such as categorising, generalising, comparing, sequencing, inferring cause and effect and summarising develop concomitantly with reading comprehension skills. Reading becomes increasingly rapid and efficient. By Grades 9-12 learners should be able to read from a wide variety of texts with different viewpoints.

From the brief sketch above it is clear that reading is a complex accomplishment requiring the coordination and integration of different knowledge bases and types of processing. The kinds of skills that underlie academic literacy that Weideman (2011) refers to should start emerging in primary school from Grade 4 onwards. However, the processes and skills involved in decoding and comprehension do not develop in the same way or at the same space. To explore butterfly effects in reading it is important to examine more closely the initial states of reading that support comprehension.

4. Decoding: starting the reading trajectory

Learning to read essentially rewires the brain. New neural pathways and processes not used in oral language processing need to be established for processing written language (Castro-Caldes et al. 1999; Wolf 2008). Decoding processes involve "visuo-auditory-motor associations in the left hemisphere" (Landgraf et al. 2012: 136). Given the neurological architecture of reading, it is important to recognise that the developmental trajectories for decoding and comprehension are different. Paris (2005) argues that major differences in the trajectories of reading skills are reflected in different times of skill onset, duration of acquisition and levels of performance. He distinguishes between constrained and unconstrained skills. Most components of decoding are constrained, whereas vocabulary and comprehension are largely unconstrained skills.

Decoding involves knowledge of the alphabetic principle (letter-sound relationships), phonological awareness, print knowledge, word recognition and fluency. These are examples of constrained skills. Because they contain fairly finite sets of features their scope is limited, the learning trajectory is steep, acquisition is brief and full mastery is expected relatively quickly (Paris 2005: 184, 188). For example, children should master decoding skills by Grade 3. On the other hand, unconstrained skills such as vocabulary and comprehension are open-ended and development can last a lifetime. We are continually expanding our vocabulary as we grow, and honing our comprehension skills to construct meaning from complex texts. Vocabulary and

comprehension are related to a range of academic skills throughout our lifespan and one can never claim to have achieved complete 'mastery' of such skills.

Phonological awareness refers to awareness of the sound properties of words, and includes the ability to perceive and manipulate sounds in words, e.g. blending sounds *(fl+a+t = flat)*, or deleting sounds (*flat* without *l* is *fat*). Phonological awareness develops as a result of alphabetic literacy, i.e. through formal reading instruction children develop greater phonological awareness (Juel & Minden-Cupp 2000; Castles & Coltheart 2004).

There has been a vast body of research testifying to the predictive power of phonological awareness in early literacy development (cf. for example Wagner & Torgesen 1987; Adams 1990; National Reading Panel 2000; McGuiness 2004). This applies equally to reading in a first language and L2 or bilingual reading (e.g. Rubin & Turner 1989; Comeau et al. 1999; Carlisle et al. 1999; Chiappe & Siegel 1999).

Word recognition refers to the ability to recognise a word in the linear sequence of letters on a page without conscious effort, i.e. without having to sound out the individual letters or guess what the word is. Initially word recognition starts as a slow, halting, conscious and often effortful process which relies on letter identification, knowledge of letter-sound relationships, and combining groups of letters into larger units. It combines phonological, orthographic, morphosyntactic and semantic knowledge. Through practice it becomes increasingly accurate and speeds up. Word recognition relies on visual attention which focuses gaze on written words (Landgraf et al. 2012) and enables word comparison (perceiving the difference between *tree* and *three*). Automaticity in word recognition is regarded as being essential for efficient reading since it frees up attentional capacity to focus on meaning. It develops through practice, through regular, extensive exposure to reading print (LaBerge & Samuels 1974; Stanovich 1986).

Fluency refers to the ease and speed with which reading takes place. Dysfluent readers read slowly and in a ponderous, monotonous tone. Fluent readers pay attention to punctuation and natural pauses in sentences and phrases, and they chunk strings of words appropriately. Kuhn and Stahl note that "once a learner has established this level of comfort with print, it is easier to construct meaning from a text" (2003: 413). It is at this stage that learners make the transition from 'learning to read' to 'reading to learn' (Chall et al. 1990).

Oral fluency is measured in terms of words read per minute. This is linked to a language's orthographic system and is also determined by age, skill level and complexity of text being read. There has been fairly extensive research on reading speeds in English linked to age levels, for example the average reading speed of Grade 2 English readers is 90 wpm. McGuiness (2004: 192) states that it is very difficult to process meaning when reading slower than this.

While research into reading in an L2 is not as extensive as its L1 counterpart, an increasing number of comparative L1/L2 reading studies have been undertaken at different age levels. L2 reading theories tend to draw quite heavily on L1 reading theory, the assumption being that the underlying skills and processes involved in reading languages with similar writing systems are similar in humans across languages. Thus decoding processes have been found to be similar in languages whose written code is based on the alphabetic principle (e.g. Geva & Zadeh 2006; Lipka & Siegel 2007).

5. Research focus

Recognising the difference between decoding and comprehension is important for it has developmental as well as pedagogical implications. Large scale assessment of the reading comprehension abilities of children in middle primary school undertaken in this country have shown very low comprehension levels, for example the systemic evaluations in Grade 6 (Department of Education, 2005) and the Grade 4 and 5 results of PIRLS 2006[1] (Howie et al. 2008).

From a reading instructional point of view poor comprehension can mean several things: learners can decode but have problems comprehending because they lack language proficiency; they can decode but have problems comprehending, possibly because there is not enough classroom focus on helping them to construct meaning during reading; they have problems comprehending because they cannot yet decode properly. This article focuses on the latter option by examining the decoding skills of learners in relation to their comprehension skills.

Firstly, it presents data pertaining to the comprehension skills of Grade 6 learners in Northern Sotho (henceforth N Sotho) and English at two high poverty township schools over a 2-year period and the kinds of reading competencies that characterise early academic competence. Thereafter the decoding skills of a smaller sample of learners are assessed and their relationship to comprehension examined. Four research questions are posed:

1. *How do the Grade 6 learners perform with regard to reading comprehension in N Sotho and English across the two schools?*
2. *How do the Grade 6 learners perform with regard to three subtests of comprehension in N Sotho and English across the two schools?*
3. *What is the relationship between phonemic awareness, word recognition, oral reading fluency and reading comprehension?*
4. *What is the relationship between reading comprehension and academic performance?*

6. Methodology

Two high-poverty primary schools in a township west of Pretoria were involved in a 5-year longitudinal literacy intervention from 2005-2009. This was a multi-level project that aimed to improve learners' school performance through literacy development, by building resources and capacity in high-poverty primary schools (cf. Currin & Pretorius 2010; Pretorius & Lephalala 2011).

A memorandum of agreement was signed between the research team, the school principals and the Gauteng Department of Education, stating the terms and conditions of the project. It was approved that data gathered to monitor project progress could be used for research purposes, and that ethical principles of research would be adhered to. A pre-posttest quasi-experimental research design was used to monitor the literacy progress of the learners during the project period.

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[1] PIRLS stands for Progress in International Reading Literacy Study, where South Africa was one of the 40 participating countries. The reading literacy tests were conducted in all official South African languages. Learners who did the reading tests in their African language performed most poorly of all.

6.1 The school contexts

The Grade 6 learners in this study attended two poorly resourced primary schools in a township in Gauteng (in all, there are 26 primary schools in this township). The total number of learners at both schools fluctuate around 600 children annually. In both schools, there are 16 teachers, a principal, 2 administrative staff and a janitor. Both schools serve children from the surrounding low socioeconomic community but they also have many children from informal settlements surrounding the township.

School A: This school provides primary language instruction in N Sotho in the Foundation Phase, after which the language of learning and teaching (LoLT) changes to English in Grade 4. N Sotho continues to be taught as a subject up to Grade 7. The school is predominantly N Sotho speaking (about 80%), but there are also speakers of other African languages at the school, especially Tswana and Zulu.

School B: Unlike the majority of primary schools in the township that provide initial home language instruction during the first three years of schooling, this school has adopted a straight for English policy. English is used as the LoLT from Grade 1, with N Sotho taught as a subject from Grade 2-7. Although N Sotho is the African language offered as a subject, there are relatively fewer N Sotho speakers at this school (about 62%) compared to School A, and more speakers of other African languages at the school, especially Tswana and Zulu.

6.2 Participants

The 2008 and 2009 Grade 6 cohorts at School A comprised 77 and 73 learners respectively. The 2008 and 2009 Grade 6 cohorts at School B comprised 72 and 83 learners respectively. The mean ages of each cohort are given in Table 1.

Each year a smaller sample of Grade 6 learners was selected from the larger cohorts at School B. These comprised 36 and 43 learners from 2008 and 2009 respectively.

6.3 Test Instruments

All the Grade 6 learners at both schools were given a reading comprehension test at the beginning of the school year (February) and again at the end of the year (November). The same test was first administered at each school in English and then three weeks later in N Sotho. The 3-week interval between these tests was deemed long enough to reduce memory effects. These were group administered, pencil-and-paper tests.

During the second term the smaller sample of learners were all tested individually for decoding skills in English, involving three subtests. All the testing was undertaken during school hours.

Reading comprehension: N Sotho and English reading proficiency was operationally defined as proficiency obtained in a reading comprehension test, using a combination of test items such as multiple choice questions of an inferential nature, vocabulary questions, cloze items, identifying referents of anaphoric items, and questions involving visual information, e.g. maps, graphs. The text passages were taken from various Grade 6 textbooks.

The ability to answer inferential comprehension questions rather than literal questions is a reliable indicator of how well a reader understands a text (Oakhill & Cain, 1998). The majority of

questions were a mix of straightforward and more cognitively demanding inferential questions; two interpretive comprehension questions were also included.

In the cloze task, approximately every 9th word was deleted, if it was appropriate and could be inferred from the text. Although the same passages were used in English and N Sotho for the cloze activities and the same number of deletions was designed, the same linguistic items were not deleted. Deletions were guided by the textual clues provided by the morphosyntactic and semantic features of each language text.

The ability to resolve anaphoric references in a text is an integral part of reading skills (Webber 1980). Specific anaphoric items were identified and the learners were required to underline the referents to which they referred. This section of the text was carefully explained to the learners beforehand in the test language, with an example on the chalkboard.

Decoding skills: Three different subtests were used to assess decoding skill, viz, a phonemic awareness test, a word recognition test (out of context) and an oral fluency test.

Phonemic awareness: Although phonemic awareness is usually tested on early readers (e.g. Grades 1-3) it was decided to include a phonemic subtest to see how well the Grade 6 learners were able to discriminate sounds in English words. In all, 15 items were included, with three items involving the deletion of sounds at the beginning of a word (e.g. if we take away /b/ in *book* what are we left with?), the deletion of sounds at the end and in the middle of a word. In other words, the test determines whether the learner can recognise what part of a word is left if a sound or syllable is taken away.

The phonemic awareness test is administered orally. The learner does not read anything; s/he simply listens, repeats the given word and then responds by performing an operation. For example: Kgomotso, please say the word *picnic* (learner repeats *picnic*). Now say it again, but don't say *pic* (learner says *nic*). The learner practises on 3 words before the testing starts. The researcher attempted to make it a fun activity and many of the learners enjoyed doing it.

Word recognition: The Burt word analysis test was used to assess word recognition. This test comprises a list of 110 words, arranged in groups of ten, starting with common, short and easy high-frequency words, with the words gradually becoming longer and more low frequent (BURT word reading test 1974).

One of the characteristics of a good test is that it must be 'natural', i.e. it must use language in its context. However, the purpose of a test also determines its design. The reason why a word recognition test contains words in isolation is because one specifically wants to see how well a reader has developed automaticity in reading without using other clues in a sentence to work out how to read a word. The ability to recognise words automatically, rapidly and accurately is characteristic of a skilled decoder. A learner who pays conscious attention to individual words and tries to work out how to read them has not yet automatised lower level decoding skills.

Only those words that the learner could read aloud straightaway were tallied. Short hesitations before saying a word were recorded (e.g. three dashes before a word ---girl indicated that that the learner hesitated for 3 seconds before saying the word correctly.) If a learner hesitated for longer than 3 seconds then it was deemed that there was no instant recognition of the word. Only the number of words read correctly and without hesitation was totalled.

Oral reading fluency (ORF): The ability to read texts fluently, i.e. at an appropriate rate, accurately and with expression, is an important component of reading ability. ORF is an assessment tool that focuses on two of the three components of fluency, namely, rate and accuracy. It is based on a score obtained for the number of words read correctly in a minute from an unseen passage (Hasbrouck & Tindal 2006). In this case the passage was taken from a short story about a young man who wants to become a taxi driver, so the topic was one that was familiar to the learners.

The learner was told that s/he would need to read a passage aloud for a minute. The learner was first shown the passage, read the title aloud, looked at an accompanying picture and answered two or three questions about the picture and the title. The learner then read the passage for a timed minute, during which time the researcher followed the reading of the passage on a photostated sheet and ticked words that the learner read incorrectly or ignored punctuation. At the end, the number or errors were subtracted from the total number of words that the learner reading during the minute. This gave a score of words read correctly per minute (wcpm).

6.4 Assessment procedures

Comprehension: The reading comprehension tests were pen-and-paper tests, administered to the whole class during a double period. Each different type of activity (e.g. multiple choice formats, cloze, etc) was carefully explained to the learners to make sure that they understood what was expected of them. The English and N Sotho reading comprehension tests were administered by mother tongue speakers of English and N Sotho respectively. The comprehension tests in the two languages were three to four weeks apart, to minimise memory effects.

Decoding: The Grade 6 learners were assessed individually by the researcher on the phonemic, word recognition and ORF subtests. The researcher had been involved at the schools for three years and was thus familiar to the learners. During the years in which this research was conducted the researcher also facilitated a book club with the learners for 40 minutes once a week and thus came to know them quite well. The decoding tests were administered during school hours in a quiet corner of the school library. It took approximately 10 minutes to assess each learner individually.

All the data was captured and analysed on SPSS.

7. Results

The first research question aims to get a general idea of how the learners at the two schools were able to make meaning from written texts.

1. *How do the Grade 6 learners perform with regard to reading comprehension in N Sotho and English across the two schools?*

Descriptive statistics displayed in Table 1 provide a profile of the two cohorts of Grade 6 learners with regard to overall reading comprehension in N Sotho and in English. Besides the mean of each school cohort across the two years, the percentiles reflect mean differential performance of the weak (25th), average (50th) and better (75th) performers in each cohort.

Table 1:   Grade 6 pre- and posttest comprehension 2008-2009

	Comprehension 2008				Comprehension 2009			
	N Sotho		English		N Sotho		English	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
School A								
2008 (n = 77) (12.1yrs)								
2009 (n = 73) (12 yrs)								
Mean	31.9	34.2	35.3	32.0	35.4	37.2	35.03	41.7
SD					(15.8)	(19.6)	(18.3)	23.6)
Percentile 25th	21.2	20.4	22.7	18.1	26	18.1	19.6	19.04
50th	30.3	29.5	33.3	27.2	36.3	36.3	33.3	35.7
75th	42.4	45.4	45.4	39.7	47.7	51.1	45.4	57.7
School B								
2008 (n = 72) (11.9 yrs)								
2009 (n = 83) (11.7 yrs)								
Mean	31.4	35.2	36.4	44.8	36	41.1	39.6	46
SD	(15.4)	(15.8)	(13.8)	(13.6)	(16.5)	(18.1)	(20.06)	(21.2)
Percentile 25th	17.8	22.7	26.1	23.2	21.9	29.5	24.2	29.7
50th	28.1	36.3	36.3	43.7	36.3	38.6	33.3	44
75th	43.7	47.7	45.4	66.7	48.4	53.9	59.1	59.6

Three trends are evident: firstly, reading comprehension was generally low, irrespective of the language in which the comprehension test was administered. Secondly, while there was great variety in terms of performance in both languages, surprisingly the learners were generally slightly better at constructing meaning from English texts than from N Sotho texts, especially learners at the 75th percentile. Thirdly, learners at the 25th percentile showed little improvement in comprehension in either language from pre- to posttests.

2.   How do the Grade 6 learners perform with regard to three subtests of comprehension?

The second research question looks more closely at three subcomponents of the reading comprehension test. These involved the ability to perceive sequence in a series of narrative

events (the learners were asked to re-arrange 6 sentences taken from text to reflect the sequence of events in the story), the ability to make inferences from linguistic clues in a text in order to fill in appropriate words in a cloze task, and the ability to answer questions based on visual information (interpreting information from a map). The results are reflected in Figure 1.
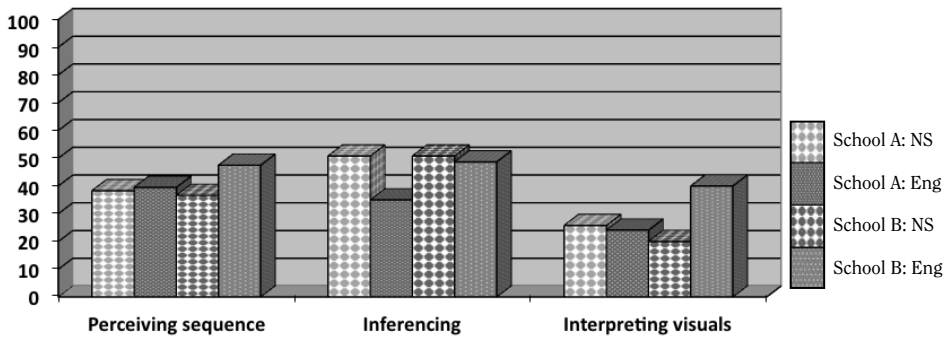

Figure 1: Academic literacy – Means for Schools A and B in N Sotho and English

Since the learners in School A had the benefit of 3 years of literacy in N Sotho before doing it as a subject from Grade 4, their performance on these subcomponents was expected to be better than in English. As can be seen from Figure 1, this was the case in the inferencing task in N Sotho but their performance in the other two subcomponents was similar in both languages. In School B where they had had more exposure to English, their performance in the subcomponents was slightly better in English than in N Sotho. However, in both schools performance was generally low, even in the inferencing task (hardly above 50%), which suggests that they were not good at utilising linguistic clues in the text to construct appropriate meaning in order to fill in the gaps. Their performance in inferring information from a map was not strong, suggesting a lack of familiarity with this kind of meaning making. These Grade 6 learners were only a year away from high school yet their performance in these components suggest that the meaning making skills associated with academic literacy were by no means well established.

In order to further explore why the learners seemed to struggle with reading comprehension and why their gains during the year where so small, a smaller sample of learners within the Grade 6 cohort at School B was tested individually for decoding skills in 2008 and 2009 respectively.

3. *What is the relationship between phonemic awareness, word recognition, oral reading fluency and reading comprehension?*

The mean age for each group is given in Table 2 across the 2-year period, as is the mean and range of performance in each subcomponent of the decoding test. The mean performance at the 25th, 50th and 75th is also given.

As can be seen, the readers who performed poorly in comprehension also performed very poorly on all the subcomponents of the decoding test. They struggled to manipulate sounds in words, they recognised far fewer words and they read extremely slowly. Between Grades 6-8, average

Table 2: Grade 6 decoding skills

Age 12.2 11 — 14yrs	Phonemic awareness %	Word recognition	ORF†	Posttest Comprehension %
Grade 6 2008 (n= 36)				
Mean	67.9	57	76	47.9
Min-max	0 — 100	4 — 95	5 — 124	6 — 88
Percentile 25th	48	44	42	25
50th	69	60	84	45
75th	92	77	110	68
Grade 6 2009 (n=43)				
Mean	68	53	71	46
Min-max	0 — 100	0 — 85	1 — 140	9 — 97
Percentile 25th	53	42	44	29
50th	73	53	75	44
75th	86	65	99	60

† wcpm = words read correctly per minute. By Grade 6 readers should average about 120 wcpm.

oral reading speeds tend to level off at about 150 wcpm (Hasbrouck & Tindal 2006). According to the oral reading fluency norms in Hasbrouck and Tindal (2006: 639), Grade 1 children at the 50th percentile read at about 53 wcpm by the end of the year. The weak Grade 6 readers in this sample were not even achieving these Grade 1 norms. The Grade 6 average readers were hardly reading at the rate expected of average Grade 2 norms, while the stronger readers were approximating Grade 3 norms. The grade norms above are predicated on L1 reading levels so some reading researchers (e.g. Anderson 1999) recommend that L2 readers should read at least at 70% the rate of L1 readers. Even on this latter reckoning, the Grade 6 learners were reading too slowly for their age and grade level. These kinds of scores point strongly to poor decoding skills and lack of regular practice in reading connected text to strengthen accurate and automatic processing of written language.

Pearson's correlation was used to test the relationship between the decoding skills and reading comprehension. The results are provided in the correlation matrix in Table 3 below. Strong and significant correlations obtained among all the components.

To see which of the decoding skills best predicted reading comprehension, a multiple regression analysis was performed. Given the relatively small sample sizes, the data sets for 2008 and 2009 were combined. Reading comprehension was the dependent variable and phonemic awareness, word recognition and ORF were entered as independent variables, using the Enter method. A significant model emerged: adjusted R^2 = .58, $F(3, 73)$ = 36.961, p< .001. ORF emerged as the strongest predictor variable accounting for 49% of the variance. Comprehending Grade 6 texts

Table 3:   Correlation matrix for decoding and comprehension †

(total n = 77)	1. Comprehension	2. Phonemic awareness	3. Word recognition	4. ORF
1. Comprehension		.62	.74	.76
2. Phon. awareness			.76	.68
3. Word recognition				.90

† All correlations significant at .001

was an extremely challenging task for learners who did not have strong decoding skills.

Since reading is reputed to form the basis for academic competence, the final research question sought empirical evidence for this by examining the relationship between reading comprehension and the average exam score that the learners obtained in their final examinations at the end of Grade 6. This final average score reflects their academic performance aggregated from all seven subjects in which they wrote examinations, viz. N Sotho, English, Technology, Mathematics, Arts and Culture, Natural Science and Economic Management Science.

4.   What is the relationship between reading comprehension and academic performance?

Using a Pearson product moment correlation, a very strong relationship was found between English reading comprehension and average exam score r = .86 (p= .000). A very strong relationship was also found between ORF and average exam performance r = .82 (p=.000). This result confirms the claim that reading ability is a critical skill in the formal learning context.

8. Discussion

There are numerous interdependent variables at national, district, community, school, teacher and classroom level that contribute to the effective – or not – functioning of a school and the successful accomplishment of literacy. This is especially so in high poverty schools. The focus in this article is a narrow one for it looks specifically at the reading competence of Grade 6 learners and examines the relationship between comprehension ability and lower level decoding skills. However, the results do reflect on pedagogical practices at the schools.

The Grade 6 cohorts that were examined here comprise a small sample, drawn from two schools only over a 2-year period. Given the small sample size, caution is advised when extrapolating to the larger population. However, it is fair to say that the two schools represented here are fairly typical of many poor primary schools across the country which underperform academically.

The majority of Grade 6 learners in this study struggled to make sense of the texts they read, irrespective of the language in which they did their reading. There was weak evidence of the emergence of early academic literacy, such as the ability to perceive sequence in text information, to make inferences from textual clues or to make sense of graphic information in texts. Yet these are reading abilities that are crucial for academic success and, if not acquired during middle primary school (i.e. from Grade 4 onwards), have severe consequences later where "reading science and social studies texts becomes an almost impossible task" (Chall et

al. 1990:14). As the correlations in this study show, the ability to comprehend written text was strongly related to academic performance.

As mentioned earlier, poor performance in reading comprehension can point to many things, one being low proficiency in the language in which reading is done. Language policy did not overtly seem to have an effect on the development of reading since the Grade 6 learners in School A, who had had N Sotho as LoLT in Grades 1-3 and thus, in theory at least, should have had the advantage of initial reading instruction in the home language, did not perform any better on the N Sotho comprehension tests than the learners who attended School B that goes straight for English and where they only study N Sotho as a subject. Spoken language competence is not an adequate basis for understanding written texts. Only reading develops reading. If these learners had problems making meaning when reading both L1 and L2 texts, then these results point to lack of time spent on reading and problems with reading instruction over and above school language policy, indicating a need to explicitly develop academic language proficiency in both L1 and L2 as well as a need to help learners become more strategic comprehenders. These are all factors that merit further investigation.

Most of these Grade 6 learners started school in 2003 and 2004 but accurate information about how they were taught to read at both schools at that time was not available. Testing for decoding skills in these 11-12 year-olds was an attempt to trace butterfly effects in reading comprehension and to determine to what extent lower-level decoding skills, supposed to be developed during Grades 1-3, impact on reading comprehension in Grade 6. The results of all three subtests revealed poor development of decoding skills, and decoding ability also showed a strong correlation with reading comprehension. The stronger the learners performed on the decoding subtests, the better they were at comprehension. This provides robust evidence that decoding skills form the basis of and enable the kind of reading abilities required for comprehension.

Phonemic awareness is one of the most basic skills that underlie decoding. The ability to distinguish sounds and to perceive sequences of sounds in words enables learners to grasp the letter-sound relationships of a written alphabetic code and to learn how to segment sound sequences or blend sounds when encountering new and unfamiliar words while reading. The very weak Grade 6 readers in each cohort had poor phonemic awareness (less than 50% accuracy) and found it difficult to distinguish and manipulate sounds at the beginning, middle or ends of words. These were also learners whose mean comprehension performance was 27% or less in both N Sotho and English. This indicates poor understanding of the phonemic principles and sound properties of words with an alphabetic code, despite six years of schooling. In their study of children from multilingual backgrounds learning to read in English, Muter and Diethelm (2001) found that ability in phonological segmentation was a strong predictor of early reading achievement. They argue that "the same cognitive constructs account for reading skills of children irrespective of their language background or their oral proficiency" (2001:216).

Although there was a robust correlation (r = .62) between phonemic awareness and reading comprehension in the current study, phonemic awareness did not emerge as a predictor of

comprehension. This is not surprising, since phonemic awareness is a predictor of early reading development; its influence diminishes as learners grow older and other decoding skills develop, such as word recognition and fluency. Nevertheless, as the data from this study suggests, the reading trajectory for learners whose phonemic butterflies had flapped their wings and taken off was different from those learners whose phonemic butterflies had not flapped their wings, and the effects were still evident six years downstream.

Phonemic awareness also underlies word recognition, the ability to rapidly and accurately perceive the sequence of sounds that make up a word. In fact, the findings showed a strong correlation (r = .76) between phonemic awareness and word recognition. The ability to recognise words quickly and accurately has long been associated with skilled reading (e.g. Stanovich 1986; Landgraf et al. 2012). This is because attention (i.e. cognitive effort) is required to perform a reading task. Attention expended on decoding takes attention away from comprehension. Because decoding is a constrained skill, a high level of mastery should be achieved relatively quickly. Unless the subcomponents involved in decoding are automatised, reading will be slow and effortful. As automaticity in word recognition develops, this frees up attentional capacity to focus on meaning. As the results from this study show, the stronger readers in this study all scored higher on the word recognition subtest and a correlation of .74 was found between word recognition and reading comprehension, thus corroborating evidence found from other studies (e.g. Adams 1990; Vadasy et al. 2008).

The regularity and frequency of words affect word recognition skills. In Wang & Koda's study (2005), word frequency was a strong determiner of reading skill – both regular and exception words were recognised more quickly than low frequency regular words and there was a clear similarity between L1 and L2 word recognition processes. The first 30 words in the Burt word test are mainly high frequency words, yet for many of the Grade 6 learners at the 25th and 50th percentiles, these words presented problems. As Wang and Koda point out "repeated exposure to written words enhances word identification not only for L1 readers, but also for L2 readers" (2005:89). If a Grade 6 learner stares at a high frequency word such as *girl* for several seconds before hesitantly saying the word aloud, then this points to serious reading instructional omissions in classrooms in the earlier grades. These learners all knew the word when they heard it, but many did not recognise it in print. Here too we can see butterfly effects: the development of rapid and accurate word recognition skills in the early years of schooling help to provide the 'initial conditions' on which comprehension is dependent.

Oral reading fluency reflects the ability to chunk language appropriately according to written conventions. These conventions assume phonemic knowledge, knowledge of the alphabetic principle as well as automatic word recognition. In fact, in this study there was a very strong correlation of .90 between word recognition and oral reading fluency, and oral reading fluency emerged as a robust predictor of reading comprehension in Grade 6, confirming prior research in this area. Hasbrouck and Tindal (2006:636) state that oral reading fluency is an "accurate and powerful indicator of overall reading competence, especially in its strong correlation with comprehension". Yet, although the stronger readers at the 75th percentile had higher ORF and comprehension scores than their peers, they were still reading relatively slowly for their

grade level, even for L2 readers. According to ORF norms in English, by Grade 2 children should be able to read at 90 wcpm, while Grade 4 children at the 50th percentile should be able to read at 120 wcpm (Hasbrouck and Tindal 2006). The good Grade 6 readers in this study were reading at about Grade 3 level. Given the difficulties of engaging high level processes for comprehension when reading speed is slow, and even making allowance for the fact that these are ESL readers, the fact remains that tolerating low reading fluency in any language engenders literacy inequalities from an early stage in children's schooling careers.

There are a host of possible explanations why learners have problems with reading comprehension. Firstly, language proficiency, especially in L2 reading, is an obvious factor, but it does not always provide a satisfactory explanation for the problems that learners manifest in making sense of their texts since, as this study shows, such learners may also manifest similar problems when reading L1 texts. In such cases the lack of academic language competence is a contributory factor. The learners draw on their oral language competence when reading but this becomes inadequate for constructing meaning from written language from the middle primary school years onwards. Secondly, comprehension problems can also arise because learners are not strategic readers. It has been found that explicit comprehension instruction is indeed beneficial in improving comprehension ability (National Reading Panel, 2000; Block & Pressley, 2007; McNamara 2007). Thirdly, comprehension can fail simply because readers have not yet developed adequate lower level processes to support meaning making. This study examined the latter scenario and provides evidence of a robust relationship between decoding and comprehension. The findings suggest that whether or not – or how strongly – the decoding butterfly flaps its wings during the early years of reading determines to a large extent a learner's reading trajectory. In this study oral reading fluency, which is the culmination of automatised decoding skill, was a predictor of learners' ability to engage with text and construct meaning from it.

9. Pedagogical implications

According to Adams (1990) it has been estimated that by Grade 3 children encounter about 25,000 words in print, yet only a small portion of these words are directly taught. The obvious question is: what is the most efficient way to help children learn to read so many new words quickly so that, as Juel and Midden-Cupp (2000:459) put it, they can "successfully enter the world of print"?

There has been much controversy over how best to teach reading, with the debates centering around whether code-based (e.g. phonics) or meaning based (e.g. whole language) instruction best promotes reading development. Given the importance of both decoding and comprehension in reading, it is important to regard these two approaches as complimentary rather than oppositional. Indeed, there is a lot of support for a balanced, integrated approach (e.g. National Reading Panel 2000) rather than an overemphasis on phonics or simply immersing children in a literacy-rich environment without explicit code-based instruction. In their review, Bus and van Yzendoorn (1999) suggest that decoding and comprehension skills develop simultaneously and independently rather than sequentially. The findings from this study suggest a more intertwined relationship for written language; even if comprehension skills were to develop independently of decoding, it would be difficult to engage them

during the reading process if decoding skills were not adequately developed. In other words, butterfly effects imply a "sensitive dependence on initial conditions". This does not mean that decoding must precede comprehension or that it will guarantee comprehension, but it does suggest that instruction for decoding and comprehension, in the early years at least, must proceed in a lock-step manner and that development in both components must be carefully monitored.

Explicit instruction in comprehension is critical, especially for developing academic literacy skills that are important not only for 'reading to learn' but also for engaging with texts at a deeper and more meaningful level. However, if learners do not understand the phonics principles underlying an alphabetic code and do not develop adequate decoding skills in the early years of schooling then literacy inequalities are bound to set in early and it will be difficult to catch up, even if comprehension instruction is provided. This is due to cognitive processing limitations: if lower level decoding skills are not automatised, there is inadequate attentional capacity for higher order comprehension skills. Automatising decoding does not imply meaningless drills but it does require constant exposure to texts and practice in decoding and interpreting them. The principle of "10,000 hours of practice" that Malcolm Gladwell (2008) popularised in his book on what makes people successful is certainly applicable to reading. Exposure to books and opportunities to practice reading are usually the very ingredients that are missing in high poverty schools.

As a result of the overwhelming evidence of the predictive power of phonological awareness in early reading, phoneme awareness training has been recommended (e.g. National Reading Panel 2000). Muter and Diethelm (2001: 216) also state that "the acquisition of reading by L2 learners can be radically improved by teaching phoneme awareness and phonics". However, McGuiness (2004:186) questions the need for a special phoneme awareness program and argues that a "good linguistic-phonics program at the outset" can do the job just as well.

Daily activities such as class reading, independent reading at appropriate level, and repeated reading create opportunities for building automaticity while also attending to meaning, and expose learners to extended texts and different genres of text. Problems with decoding can easily be masked by whole class choral participation in reading activities, which can create a false impression that successful reading is happening. This is particularly so in large classes. It is vitally important for teachers to make time for listening to children reading individually so that decoding problems can be identified and remediated early. To summarise:

- Lots of instructional time must be set aside to develop strong reading skills from an early age. This should include an explicit and systematic phonics programme.
- Reading must become a regular classroom activity every day and should include paired reading, class reading, repeated reading and independent reading in addition to phonics instruction.
- In high poverty schools there should be a move away from the tendency for choral reading of words or single sentences from a chalkboard to group, paired and individual reading of extended texts.
- Reading homework in high poverty schools is rare. Assigning reading for homework

increases out-of-school reading activity and maximises opportunities for reading practice.

- There is a tendency in high poverty schools for underperformance to be normalised. Teachers should be made aware of normative frameworks for reading development so that they can ensure that learners perform at their expected grade levels.

- Attention should be given to the explicit teaching of reading strategies. If learners are shown how to read with greater understanding, they experience reading as a meaningful activity and hence are more likely to engage in voluntary reading, which in turn will increase opportunities for developing automaticity and fluency.

- Learners should be motivated to read more and to experience reading as pleasurable so that they feel positive about reading and are thus more likely to engage in voluntary reading activities, thereby increasing decoding skills.

- The individual assessment of reading in the Foundation Phase should be compulsory. This helps to monitor progress, identify problem readers and implement appropriate remediation activities. The earlier that problems are identified, the better the chances of reading recovery.

10. Conclusion

Albert Weideman dedicated many years of his life as an applied linguist to the study and assessment of academic literacy at tertiary level. He was also concerned with issues of transparency and social accountability in high stakes assessment of academic literacy. This article moves much further upstream from the tertiary flow and looks instead at the emergence of academic literacy in primary school. The findings from this study suggest that the metaphor of butterfly effects is applicable to reading. Without decoding skills, children cannot successfully enter the world of print; decoding skills are critical for reading comprehension, which in turn forms the foundation for the development of academic literacy. Although phonemic awareness, automatic word recognition and fluency in reading all correlate strongly with reading comprehension it seems that by Grade 6, oral reading fluency emerges as a strong predictor of comprehension.

While this study does not deal directly with issues of transparency and social accountability in literacy assessment, these issues do arise more generally in relation to reading instructional practices. There is minimal accountability in a schooling system that allows learners to reach Grade 6 without sound decoding skills, skills which should already have been developed by Grade 3. It is important for schools to assume the responsibility of launching learners on successful reading trajectories as quickly as possible, in whatever language they do their schooling. For this to happen, attention must be paid to the early development of strong decoding skills to enable comprehension. The learners in this study are testimony to a system of schooling that engenders literacy inequalities from an early age and enables a large number of learners to reach Grade 6 without the basic reading skills that are supposed to be well developed by the end of Grade 3. This suggests a lack of transparency and accountability. Butterfly effects come in different guises and are evident throughout the schooling system. Getting reading right from the start can go a long way in addressing issues of social justice and redress in our society.

REFERENCES

Abadzi, H. 2006. *Efficient learning for the poor*. Washington, DC: The World Bank.

Adams, M. 1990. *Beginning to read: Thinking and learning about print*. Cambridge, MA: MIT Press.

Anderson, N.J. 1999. Improving reading speed: Activities for the classroom. *English Teaching Forum* 37: 2-5.

Block, C.C. & Pressley, M. 2007. Best practices in teaching comprehension. In: Gambrell, L.B., Morrow, L.M. & Pressley, M. (Eds.) *Best practices in literacy instruction*. New York: The Guilford Press.

Bhattacharya, A. 2010. Children and adolescents from poverty and reading development: A research review. *Reading and Writing Quarterly* 26:115–139.

BURT word reading test. 1974 Revision. eric.ed.gov/ERICWebPortal/recordDetail?accno ED191016

Carlisle, J.F., Beeman, M., Davis, L.H. & Spharim, G. 1999. Relationship of metalinguistic capabilities and reading achievement for children who are becoming bilingual. *Applied Psycholinguistics* 20: 459–478.

Castles, A. & Coltheart, M. 2004. Is there a causal link from phonological awareness to success in learning to read? *Cognition* 91: 77–111.

Chall, J.S. 1983. *Stages of reading development*. New York: McGraw-Hill.

Chall, J.S, Jacobs, V.A. & Baldwin, L.E. 1990. *The reading crisis: Why poor children fall behind*. Cambridge, Mass.: Harvard University Press.

Chiape, P. & Siegel, L.S. 1999. Phonological awareness and reading acquisition in English- and Punjabi-speaking Canadian children. *Journal of Educational Psychology* 91: 20–28.

Comeau, L., Cormier, P., Grandmaison, E. & Lacroix, D. 1999. A longitudinal study of phonological processing skills in children learning to read in a second language. *Journal of Educational Psychology* 91: 29–43.

Cummins, J. 2000. *Language, power and pedagogy*. Clevedon: Multilingual Matters.

Currin, S.V. & Pretorius, E.J. 2010. The culture of the sharp pencil: Can a literacy intervention lever school change? *Reading & Writing* 1(1): 23-46.

Department of Education. 2005. *Grade 6 Intermediate Phase Systemic Evaluation Report*. Pretoria. Department of Education.

Dizikes, P. The meaning of the butterfly. *The Boston Globe*, 2008: June 8. www.boston.com/bostonglobe/ideas/articles/2008/06/08/the-meaning-of-the-butterfly/ Accessed 2 April 2012.

Geva, E. & Zadeh, Z.Y. 2006. Reading efficiency in native English-speaking and English-as-a-second-language children: The role of oral proficiency and underlying cognitive-linguistic processes. *Scientific Studies of Reading* 10(1): 31–57.

Gladwell, M. 2008. *Outliers: The story of success*. London: Penguin Books.

Hasbrouck, J. & Tindal, G.A., 2006. Oral reading fluency norms: A valuable assessment tool for reading teachers. *The Reading Teacher* 59: 636–644.

Howie, S., Venter, E., van Staden, S., Zimmerman, L., Long, C., du Toit, C., Scherman, V. & Archer, E. 2008. PIRLS 2006 Summary Report: South African Children's Reading Achievement. Centre for Evaluation and Assessment, University of Pretoria.

Howie, S., Venter, E. & van Staden, S. 2008. The relationship between English second language proficiency and mother tongue in non-native English speakers in South Africa. Paper presented at the International Research Conference of the International Association for the Evaluation of Educational Achievement, Taiwan, September 2008.

Juel, C. & Minden-Cupp, C. 2000. Learning to read words: linguistic units and instructional strategies. *Reading Research Quarterly*, 35: 458–498.

Koda, K. 2007. Reading and language learning: Crosslinguistic constraints on second language reading development. *Language Learning 57* (Suppl. 1): 1-44.

Kuhn, M.R., & Stahl, S.A. 2003. Fluency: A review of developmental and remedial practices. *Journal of Educational Psychology* 95(1): 3–21.

Laberge, D. & Samuels, S. 1974. Toward a theory of automatic information processing in reading. *Cognitive Psychology* 6: 293–323.

Landgraf, S., Beyer, R., Hild, I., Schneider, N., Horn, E., Schaadt, G., Foth, M., Pannekamp, A. & Van der Meer, E. 2012. Impact of phonological processing skills on written language acquisition in illiterate adults. *Developmental Cognitive Neuroscience* 25: S129–S138.

Lipka, O. & Siegel, L.S. 2007. The development of reading skills in children with English as a second language. *Scientific Studies of Reading* 11(2): 105–131.

McGuiness, D. 2004. *Early reading instruction*. Cambridge, Mass.: MIT Press.

McNamara, D.S. (Ed.) 2007. *Reading comprehension strategies: Theories, interventions and technologies*. New YorK: Lawrence Erlbaum.

Muter, V. & Diethelm, K. 2001. The contribution of phonological skills and letter knowledge to early reading development in a multilingual population. *Language Learning* 51(2): 187–219.

National Reading Panel. 2000. *Teaching children to read: An evidence-based assessment of the scientific literature on reading and its implications for reading instruction*. Washington, DC: US Government Printing Office.

Nation, P. & Waring, R. 1997. Vocabulary size, text coverage and word lists. In: Schmitt, N. & McCarthy, M. (Eds.) *Vocabulary: Description, acquisition and pedagogy*. Cambridge: Cambridge University Press. pp 6–19.

Paris, S.G. 2005. Reinterpreting the development of reading skills. *Reading Research Quarterly* 40(2), 184?202.

Pretorius, E.J. & Lephalala, M.M.K. Reading comprehension in high poverty schools: How should it be taught and how well does it work? *Per Linguam* 27(2):1-24.

Rubin, H. & Turner, A. 1989. Linguistic awareness skills in grade one children in a French immersion setting. *Reading and Writing: An Interdisciplinary Journal* 1: 73–86.

Saville-Troike, M. 2006. Introducing second language acquisition. Cambridge: Cambridge University Press.

Scholarpedia. Butterfly effect. www.scholarpedia.org/article/Butterfly-effect. Accessed 31 May 2011.

Stanovich, K.E. 1986. Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly* 21:360–406.

Vadasy, P.F., Sanders, E.A. & Abbott, R.D. 2008. Effects of supplemental early reading intervention at 2-year follow up: Reading skill growth patterns and predictors. *Scientific Studies of Reading* 12 (1): 51–89.

Van der Slik, F. & Weideman, A. 2009. Revisiting test stability: further evidence relating to the measurement of difference in performance on a test of academic literacy. *Southern*

African Linguistics and Applied Language Studies 27(3): 253–263. (Special edition: Assessing and developing academic literacy, ed. J Geldenhuys)

Van Djk, T. & Weideman, A. 2004. Finding the right measure: from blueprint to specification to item type. *SAALT Journal for Language Teaching* 38(1): 15–24.

Vauras, M., Kinnunen, R. & Kuusela, L. 1994. Development of text-processing skills in high-, average-, and low-achieving primary school children. *Journal of Reading Behavior* 26:361–389.

Wagner, R.K. & Torgesen, J.K. 1987. The nature of phonological processing and its causal role in the acquisition of reading skills. *Psychological Bulletin* 101: 192-212.

Wang, M. & Koda, K. 2005. Commonalities and differences in word identification skills among learners of English as a second language. *Language Learning* 55(1): 71–98.

Weideman, A. 2003. Assessing and developing academic literacy. *Per Linguam* 19 (1&2): 55–65.

Weideman, A. 2006. Transparency and accountability in applied linguistics. *Southern African Linguistics and Applied Language Studies* 24(1): 71–86.

Weideman, A. 2007. *Academic literacy: prepare to learn*. Pretoria: Van Schaik.

Weideman, A. 2011. Academic literacy tests: design, development, piloting and refinement. *SAALT Journal for Language Teaching* 45(2): 100–113.

Wolf, M. 2008. *Proust and the squid*. Cambridge: Icon Books.

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