

Reading as learning in the primary school

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How to cite this article:

Henning, E., 2016, 'Reading as learning in the primary school' *South African Journal of Childhood Education* 6(1), a504. <http://dx.doi.org/10.4102/sajce.v6i1.504>

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Reading acquisition in the 'zoom' lens of teacher education

In the more than 20 articles published in the first issue of *SAJCE* in 2016, there has been a notable increase in research on the early years of schooling. The South African educational research landscape has changed much since the founding of the journal in 2011, when childhood education had not been a main area of research focus. From 2011, research on the teaching of initial reading and of mathematics in the early grades also featured strongly in the research and curriculum capacity development programme of the Department of Higher Education and Training (DHET), in which foundation phase teacher education was foregrounded as an area of inquiry (Green *et al.* 2011). This programme, the Strengthening of Foundation Phase Teacher Education Programme (SFPTEP), yielded many publications, some of which were submitted to this journal. In the first issue in 2011, most of the articles focused on language and reading (<http://www.sajce.co.za/index.php/sajce/issue/view/47>). The need for more research on the teaching of literacy and mathematics in the primary school was a suggestion of most of the authors of the published work on these topics. Following on this nationwide programme came the Primary School Teacher Education project (PrimTEd), which is part of another intervention by the DHET, once more funded by the European Union and with a longer duration (2017–2019) than the previous programme. For this project, the areas of research that crystallised after consultation in meetings with higher education stakeholders from all universities were literacy and mathematics education.

It was during these consultations about teacher education for reading instruction that I came to the conclusion that literacy education research may be stymied by its bifocal nature: (1) young children first learn *to* read and (2) then progress to read *for* learning. I am wondering about this widely used distinction, because it separates reading competence into periods of mechanical skills and separated from reading for understanding as a main ingredient of learning. I think the learning of the graphological/graphemic bytes of reading is already oriented to comprehension and that the current separation may be a false dichotomy. Understanding, or comprehension, means that a reader is able to construct some meaning, derived from her sound awareness (including prosody – thus intonation is already a meaning-making mechanism if I read Halliday [2004; 2013] correctly), her existing lexical, semantic categories and also her syntax knowledge of a language.¹ Snow, Griffin and Burns (2005:9) said, simply, that '(r)eading is, at its basis, about language and about thinking'.

About thinking and learning when reading

The argument of this editorial article is that if one takes this definition of reading seriously, learning to read is learning to use language and learning to think from written text. A main component of this learning is the mastery of the semantic- and of the structural knowledge of the encoded language in a text. To understand the text, a reader needs some knowledge of the morphemic structures, the syntax and the lexicon of the language and has to develop some skills to 'decode' the discourse – to recognise the overall organisation of the text and its components as *systemic, functional* language (Halliday 2004, 2013). For example, in some texts the discourse is strictly embedded in a narrative genre, utilising the language register of stories – the typical genre of reading in the early grades. In other texts, there is no storyline, but the text is discursive, explanatory or argumentative. In these types of texts, such as mathematics 'word problems', or geometrical shapes descriptions, or science experiment procedures, the linguistic representation is abstract and, for most young learners, quite new as genres. In learning to read geometry texts, for instance, a reader encounters text that follows a specific linguistic and spatial reasoning structure (Spelke & Tviskin 2001). These are the type of texts young South African readers will encounter throughout their school years – increasingly so when they read science and maths texts

1. Three decades ago, Howard Gardner expressed doubts about whether Chomsky's view of syntax (Chomsky 1965) as an autonomous linguistic field would endure (Gardner 1987:218–222) in the new breed of cognitive science. Although affirmed by current views such as the view of Dorothy Bishop (Bishop 2016), the role of syntactical structure itself cannot be ignored when learners engage with text.

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in English from grade 4 onwards. They also, then, have to compose written English across the curriculum.

The question I pose is: at what stage during their reading acquisition period of learning in school will they build the lexicon, the morphemic structures and the syntax that are specific to the genres of expository text, such as in textbooks and other school texts they encounter increasingly in print or in digital format? In this article, I try to respond to this question by forwarding a proposal for a model for *reading as learning*, meaning that the teaching of initial literacy be based on the language knowledge that learners will find helpful when they read and write, specifically when they read and write science and maths texts, although the same view can serve other discourse forms in history, geography, the arts and so forth. The model that I propose includes theories of (1) reading acquisition, (2) conceptual development of mathematics and science concepts, as well as (3) the model of reading proposed by neuroscientist Stanislas Dehaene (2009) and the theory of systemic functional linguistics (SFL) as proposed by Halliday (2004; 2013). In Figure 1, the model for reading as learning is presented as a heuristic, modelling how researchers can think differently of the bifocal view of reading that was mentioned in the introduction to this editorial; I suggest that reading, right from the outset, be seen as a 'socially meaningful activity (*Tätigkeit*)' (Kozulin 1992:xvii, in Vygotsky 1992), meaning that a beginner reader learns to read as an act of learning to, ultimately, make meaning or comprehend, but also *while* learning the basics. So, while the recognition of sounds and letters is learned, I would advocate that these be optimally embedded in the words that learners will encounter in their current and future study of mathematics and science and that the pleasure aspect of reading interest be directed to interest and motivation to know more about natural phenomena and of magnitude, space and time as experienced in daily life and in children's emergent intuitive theories (Carey 2009).

There is much neuroscience evidence that the human brain is wired to attend to the natural world (a hardware legacy, which, I would argue, can be left unused in virtual reality). Even the very act of reading relies on hard wiring that

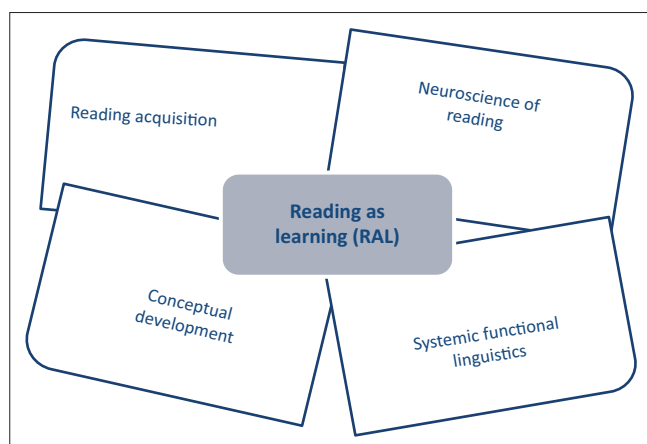


FIGURE 1: Proposed model for reading as learning (RAL).

humans had developed more than 100 000 years ago – long before written code for language emerged, which is, in its elementary form, not older than 5000 years. The identification of graphemic structures in the 'letterbox' (Dehaene 2009) area of the brain does not rely on any recent anatomical change in the brain. Reading is a far too recent socialisation for the human genome to have adapted to it (Dehaene 2009:118). The circuit of letter identification is a recircuit.

When most children start reading, around the age of six, the plasticity of the brain is optimal. This is also the time when they develop number concepts beyond their object tracking system (Carey 2009), when they begin to change their naïve theories of natural phenomena and when their newly acquired skill in reading and making meaning from text can assist them in learning – in adapting and changing concepts they have of number, for instance. It is the time when they begin to be socialised into the activity of reading as learning and when reading becomes a *Tätigkeit* – a socially meaningful activity.

At the outset of initial reading instruction, when teachers utilise 'phonics' as pedagogy, their intention is to refine sound awareness, specifically phonemic awareness. Learning to read is, at first, a skill-oriented phonological and, specifically, a phonemic skills development activity. It develops as a process in stages, which, as with all learning, overlap. The first stage is a pictorial or 'logographic' period or stage, when a child sees a word as a picture with no phonemic/graphemic (or more broadly, phonological/graphological) distinction. According to the theoretical model of Frith (1985), this is followed by the 'sounds and letters' phase, or the phonological stage of reading acquisition, when sounds and letters are seen in correspondence. This phase is, in turn, followed by the 'orthographic' (graphological) stage, when phoneme combinations, morphemes and words are gradually more easily recognised and when semantic mapping onto written language begins (Bowerman & Choi 2001; Levinson 2001). In this mapping of meaning onto words and parts of words, children utilise the meaning that is awarded to words by the language community in which reading acquisition takes place; children's encounter with the words of a language are crucial. It is much easier for children in Finland to come to terms with graphological mapping connections to a spoken language they already know well than for children in South Africa, who have to make a double adjustment in their meaning-making when they land in a 'linguistic maze' in a school where a different language is used (Henning 2012). When children learn to read, they also learn the meaning of the written words as they correspond with spoken words, or they encounter written words that *may lead them to understand spoken words*. In this regard, Levinson (2001) observed:

Once the child has cracked some word meanings, a pattern for specific language begins to reveal itself, allowing the assimilation of accumulative clues, which reinforce language-specific mapping solutions. (p. 582)

But this mapping is reliant on cognitive neuro-processing to connect language as sounds to language as letters and to connect this connection to word (and sentence) semantics (Carey 2010). According to Dehaene (2009:178), 'all writing systems, finally, jointly represent sound and meaning'. So, I would argue, decoding and learning the letters and sounds correspondence and then proceeding to recognising parts of words and whole words, and to store them in memory, establishes the mechanics of reading (decoding) as well as the building of comprehension in the blend of *phonological* and *graphological* systems. With solid memory connections, these continue to pick up speed in recognising familiar words/morphemes with which to comprehend text. In time, a young reader builds more meaning and uses representations of words and morphemes to build concepts and form other ideations too. This process has been described and studied by numerous researchers, of which Dehaene (2009) gave a comprehensive overview.

This brings the argument to the point that if meaning of text relies on intricate connections, which, in turn, rely on decoding skills and vocabulary, young readers have to recognise enough of a text to make meaning, whether directly deduced from the text, or inferred. In mathematical reasoning, an understanding of the maths symbols is a prerequisite for reasoning. These symbols include not only mathematical notation, but also the linguistic representation of these symbols. If fluent readers of English in grade 3 and 4 read mathematics texts, they know the meaning of the signified as individual bits of lexicon and also in unison in sentences. Yet, children begin to read some English in the majority of public schools in South Africa only towards the end of the second grade, and judged by outcomes of large-scale assessments, most of them do not succeed (Howie *et al.* 2008; Pretorius 2014; Spaul 2016). To be able to read science texts by the middle grades of the primary school, readers have to already be equipped with some conceptual knowledge (for which vocabulary is crucial) and they need to know the signs that are typical of such texts – its discourse. If they had encountered these signs, plus the vocabulary of science and maths, during the initial orthographic stage of reading acquisition, they could stand a better chance of reading science and maths texts by grade 4.

It is in this vein that I propose the notion of reading as learning.

The middle grades of the primary school: when reading as learning is crucial

With reference to Snow *et al.*'s (2005) basic definition of reading, I insert a few thoughts on language and thinking. Contemporary cognitive psychologists agree that language in the early years of a child's life, both in its form and its meaning, is a main communication and 'thought provoking' mechanism (Carey 2001; 2009; Gopnik 2001; 2003; Siegal & Surian 2004; Spelke 2000; 2001). Henning and Ragpot

(2015), referring to Carey (2009), Gopnik and Meltzoff (1997), and Spelke (2003), summarised some of the ideas that are currently used in developmental cognitive psychology: Words can be a 'placeholder' for a concept that is in the process of forming, it is the communication mode for learning, it is both a 'semantic filler' and a semiotic medium. Vygotsky (1992), the self-made psychologist of the 1920s and 1930s in Russia, distinguished language use and meaning, proposing a distinction between the social meaning of a word and its personal meaning, for which he used the word 'sense':

According to Vygotsky, the predominance of sense over meaning, of sentence over word, and of context over sentence are rules of inner speech. While meaning stands for socialised discourse, sense represents an interface between one's individual (and thus incommunicable) thinking and verbal thought, comprehensible to others. Inner speech is not an internal aspect of talking – it is a function in itself. (Kozulin 1992:xxxvii, in Vygotsky 1992).

Added to this sociocultural view of meaning-making by way of language, there is a host of cognitive developmental psychologists and neuroscientists who explore meaning-making as conceptual development.

I would argue that for a *reading as learning* view, this means that concepts can be articulated in language symbols that are spoken and language symbols that are written, but that when the two modalities meet, reading can serve as a source and a mechanism for learning beyond personal interaction. When young learners are able to read on their own and explore knowledge opportunities that are hidden to the not-yet literates, they gain a lasting advantage. They learn to discern the arbitrary symbols in print and make connections (Piazza 2011); they have to map these onto conceptual systems as described by Carey (2009). They 'compose' understanding: *Compositional semantics*, according to Spelke (2003), performs a combinatorial function: The meaning of words has to find a route to be combined with the meaning in *domain-specific conceptual systems*. For instance, being able to decode and to attach meaning to a sentence such as 'Gogo's dog ran away' and 'This object sunk because of its density' rely on different conceptual systems – the one on everyday knowledge and the other on science knowledge and its combinatorial semantics. This combined tool includes knowledge of the 'sense' (according to Vygotsky) of words in the context of a sentence and knowledge of individual word meanings (and sentence structures) as socialised ('meaning' in Vygotskian parlance).

Both 'sense' and 'meaning' are crucial for reading the academic texts in the middle primary school. In South Africa, this means that children have to read texts in the English language, and the linguistic forms of this language have to be known well enough to be able to serve as placeholders and to also serve as the object of conceptual mapping. Thus, written English representations of science concepts have to be recognised as cues for interpretation, otherwise they cannot be *read*.

If one accepts this view, another ‘burning issue’ arises: Are language meanings universal? With this question, one can also ask: How is compositional semantics composed? Psycholinguists, such as Levinson (2001; 2003) and Evans and Levinson (2009), and anthropological linguists, such as Tomasello (2003; 2008), continue the search for the cultural-linguistic relativity of languages, which is not the topic of this editorial, but which has to be kept in mind when exploring translation and code-switching (Henning 2012).

I now turn to Halliday – the leading scholar of SFL (Halliday 2013) – and rely on the introduction to the third issue of his seminal work, *An Introduction to Functional Grammar*, for this discussion. Much as the notion of the grammar of a language was discredited in the educational movement of ‘communicative language teaching’ (CLT) with its heyday in the 1980s and 1990s, it was recognised by Halliday as a crucial component of language in action and in thought, embedded in its system and its functions. What struck me most upon reading his work at first is the emphasis on what he termed ‘discourse semantics’ of written and spoken texts. The meaning of *units of discourse*, such as instructions in a science worksheet or the items in a test, is meaningful because of the text’s own internal discourse. One notices this with the typical ‘comprehension’ tests, when facts are checked as well as inferences and ‘discoursal’ interpretation. In the reading of a unit of discourse, the function of the reader is to act upon the text and, in ideal cases, to read the text to find information, ideas, theorems, arguments and to expand knowledge generally.

Modern English, the language of learning in the middle years of the primary school in our country, comprises specific grammar conventions. It also serves, in a written text, as an instantiation of thought (of the author and of the reader who ‘responds’ to the author). In this process of making or finding meaning, Dehaene (2009:38–43) argued that there are two routes, based on neuroimaging research: Two coexisting ‘information processing pathways’ complement each other as one reads. In the ‘phonological route’, letter strings are identified as representations of sound and then a ‘neural search’ begins from the sound space to the meaning space. In the other pathway, the route is directly to the lexical library, and, for speaking of the word, the route goes via the phonological library. In the first route, the conversion is from spelling to sound. In the second route, the conversion is along two lexicons.²

When one learns to read in a second language, while already having learned to read in a primary or home language, there is a broad consensus that the competence in the first literacy experience will enable the second literacy experience in the same way that home language as medium of instruction leads to improved learning of English later on (Taylor & Van Fintel 2016). My sense is that there is one proviso – namely, that one has to consider that spoken language has prosodic characteristics that also carry meaning and that these conventions are not universal.

2. In this regard, a personal comment is that when I encounter a new word I somehow say it aloud to begin with, breaking it into syllables if needed.

In learning to read, the process of reading acquisition is partly facilitated by knowing the rhythm, tone and melody of a language – its prosody. Readers of English, says Halliday (2013), can benefit from hearing the language and its tonal and rhythmic qualities. He proposed that, in a way, ‘written language is parasitic on spoken language’, with languages evolving and establishing their sound patterns by usage (unlike mathematics and computer language, the semiotic systems of which have been designed). I have been wondering about the notion of the ‘compositional aspects’ of a language such as English, with its different sound versions all over the world, and realise that our own South African English has its own ‘twangs’ and ‘twists’ that we come to know via the media and in speech communities. And from an SFL perspective, although sound is emphasised, the main thesis is that language words carry most meaning and that the organisation of grammar and its hierarchies encapsulates and processes this meaning primarily. Halliday (2013:21) argued that ‘grammar is the central processing unit of language – it is the powerhouse’ that generates meaning. It ‘has to interface with what goes on outside language’. Grammar is used to make sense of our experience and interaction with other people.

Possibilities for ‘reading as learning’ in the school curriculum

Combining ideas from the four fields of knowledge that I have referred to, and arguing for the notion of *reading as learning*, it is necessary to propose a specific strategy for using this heuristic (Figure 1). In an attempt to ‘instantiate’ the model in the curriculum and assessment of middle primary school learning research and also practice, I forward, firstly, an idea for a reading assessment tool. With that I then suggest a reading instruction pedagogy that relies on a pedagogical content knowledge (PCK) in which ‘knowledge of the learner’ (Shulman 1987) features prominently as one of the main knowledge types of teaching. This would mean that the theories that I have briefly discussed should ideally be incorporated into pre-service teacher education, but, equally important, also in the continuous professional development of primary school teachers. I acknowledge that this is a ‘tall order’, but with the learning outcomes of the children of this nation as they stand currently, we need to seriously consider different ways of dealing with the school curriculum.

My own suggestion would be to design local assessment instruments that can actually capture reading as learning (in English) from grade 3 to grade 6. One such instrument, with six subtests, is being designed in the research group of the South Africa Research Chair, *Integrated Studies of Learning Language, Mathematics and Science in the Primary School* (Henning 2016). For classroom teaching, I would suggest the insertion of the genres of maths and science texts into the reading programme, drawing on the content of the curriculum. This need not be seen as a massive task. In an overview of the foundation phase curriculum for mathematics and natural science (the latter within the life skills curriculum), we have

found ample language features to incorporate into reading, literally ‘across the curriculum’. At a school where we do some research, teachers in the early grades plan this type of integration quite well, and the level of English reading competence of the children (who start off in grade R in learning in their home language) is well developed by the time they enter the intermediate phase in the middle years of the primary school.

In the introduction to the third issue of his book on functional grammar, Halliday remarks: ‘A language is a series of redundancies by which we link our ecosocial environment to nonrandom disturbances in the air (soundwaves). Each step is, of course, masterminded by the brain’. This is the note on which I would like to conclude this editorial. I believe that we should take note of recent research in reading and learning much more in education studies. In the current fashionable evaluation studies genre of research, researchers (and evaluation companies) focus on learning outcomes of learners, whose teachers have been the object of interventions. In these value-added models (VAMs) of research (AERA 2015), assumptions about how children learn and learn to read are inserted into the evaluation research designs and into the interventions with teachers. I understand that funding agencies wish to see effects. I am, however, wondering what systemic effect can be derived by studies that do not investigate learners directly and in some depth. If one agrees with the FSL view of Halliday (2013), there is a need to understand how children are assessed for their knowledge of language, starting from their experience, and then how they move on to making of meaning from those experiences, and, ultimately to ‘wording’ the experiences. It is inevitable that one has to also capture how they learn grammar sufficiently well to be able to read texts of maths and science, in which the logic of grammar may scaffold their understanding.

We know very little regarding the South African middle graders’ reading of science and maths texts in English. The PIRLS studies (Howie *et al.* 2008) do not capture this type of reading in any detail. It is in the small in-depth studies of individuals that we may find the beginnings of the solution to our new ‘reading wars’. This time round the adversaries are not ‘whole language’ and ‘phonics approaches’ to teaching, but non-literate young children who have to survive in a connected, hostile, adversarial global space, where there is zero tolerance for undereducated young people, such as the ones who dropped out of school and who fill the sidewalks of the cities and the roads of villages. Imagine how different their lives could have been if they had learned to read science and maths texts in English in the middle grades of the primary school.

Hence, when I read the results of Taylor and Van Fintel’s study (2016), in which they concluded that ‘mother tongue instruction in the early grades significantly improves English acquisition, as measured in grades 4, 5 and 6’, I continue to wonder about how these findings speak to these middle graders’ reading competence in English, especially as exemplified in the reading of science and maths texts.

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