

What have we learned about reading comprehension?

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Reading comprehension, the basis for much learning, working, and enjoyment, is extraordinarily complex, and our knowledge about it is far too deep and extensive for five pages. I review *some* of what we have learned about it in recent years by addressing four questions.

1. What is it?

Reading comprehension is the application of a skill that evolved for other purposes (listening or oral comprehension) to a new form of input (text). Unlike listening comprehension, reading comprehension is not something for which our brains have evolved. Whereas oral comprehension seems to develop “naturally” with minimal deliberate intervention, reading comprehension is more challenging and requires deliberate instruction. Humans have been doing oral comprehension for 100,000 years or more (Donald, 1991), and virtually all humans do it; reading comprehension has only been practiced for 5,000 years, and for most of that time most humans did not do it (Olson, 1994). It should not be surprising that it is difficult.

Gough and Tunmer (1986) proposed the *simple view* of reading, in which reading comprehension (RC) is seen as the product of Decoding (D) and Listening Comprehension (LC); thus, $RC = D \times LC$. Though simple, this approach does a remarkably good job of accounting for the data (e.g., Johnston & Kirby, 2006), and it reminds us that the ability to decode words is absolutely essential for skilled reading; those with *either* very low decoding skill or very low oral comprehension skill will be poor reading comprehenders. Decoding or word reading is often the bottleneck that prevents readers from attaining higher adequate text comprehension (see Figure 1). I would add two important factors beyond decoding and listening comprehension, fluency and strategies. Fluency (speed and expression; e.g., Kuhn & Stahl, 2003) is not an issue in listening, as the speaker controls the pace, but is needed for reading comprehension because of working memory constraints (see below). Strategies (e.g., Dole et al., 1991) are important in reading, and more useful than in listening, because the text stays present and allows re-inspections. We expect skilled readers to extract more from text than they would from speech, and some of that comes from more strategic, goal-directed, deliberate processing. Strategies are conscious, goal-oriented plans that call on tactics which can vary from *underline long words to create a mental simulation to see if the author is right* (Kirby, 1988). Strategies depend on prior knowledge (of content, and of strategies) and on the learners' intentions; intentions can be characterized as combinations of deep and surface processing (Biggs, 1993), or depth and breadth (Kirby & Woodhouse, 1994).

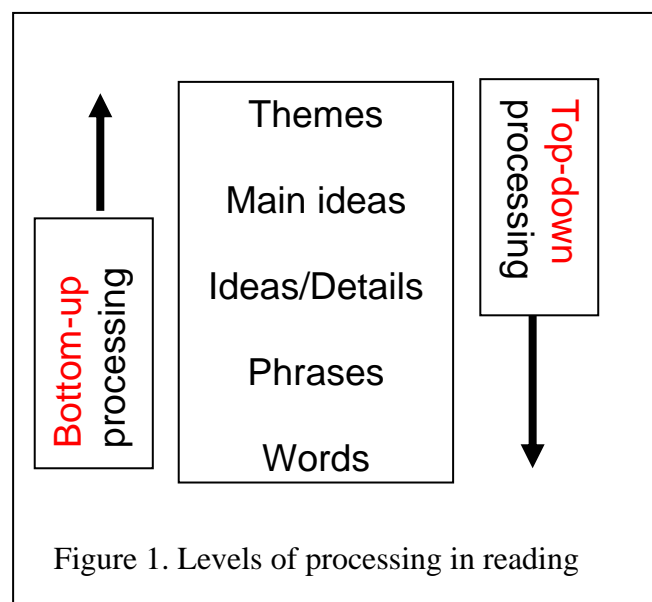


Figure 1. Levels of processing in reading

The mystery left to be explained is listening comprehension, the comprehension processes that are at the heart of reading comprehension. Comprehension is the core of verbal ability or

intelligence, and can call on nonverbal processes too. Comprehension involves the *relating* of two or more pieces of information (e.g., Kintsch, 1999). Those pieces of information can come from long-term memory (prior knowledge), but in reading comprehension at least one piece must come from the text. The pieces of information can be simple or quite complex ideas, ranging from *cat* to *democracy*. The relating can also be of many sorts, such as *is an example of*, *is the same as*, *causes*, or *acts on in a specified way*. The information to be integrated is held in working memory (Baddeley, 1986), and the relating operation takes up space there too. (Working memory is limited in capacity, in terms of the number of units that can be held at once, but not in the size of the units that can be held.) As we read, we update our mental representation of the text's meaning; these mental representations are known as mental models (Johnson-Laird, 1983) or situation models (Kintsch, 1999).

What are those *pieces of information*? They are the different types of content shown in Figure 1, for instance words, ideas, main ideas, or themes. As information is processed, the lower-level units (words or parts of words) are integrated into higher-level units; long-term memory stores some low-level information, but comprehension relies critically upon higher-level, more abstract or schematic information. The abstract information in long-term memory is stored in the form of *schemas*, which function like generalized mental or situation models. For readers with rich knowledge, a word such as *democracy* evokes and brings to life many ideas without taking up additional working memory space; for readers with less relevant knowledge, the word itself may take up one or more spaces, with no additional information brought along “for free”. Comprehension is enhanced when the contents of working memory are higher-level units; children struggling to identify words are unlikely to be able to attain even modest levels of comprehension. When lower-level units are recognized automatically, there is a greater chance of higher levels being attained. It is critical to build up the automaticity of the lower-level units (e.g., words).

Finally, it is important to recognize different types or levels of comprehension. I distinguish among three: passive comprehension (what we do when we are following a text but not analyzing or assessing it deeply), comprehension for learning (what we do when we try to remember the details and/or deeper meanings of a text), and self-regulated comprehension (what we do when we are using text to achieve our own goals). Which of these a reader employs will depend on ability, purpose, and instruction.

2. Where does it come from?

The previous section mentioned a number of factors involved in reading comprehension; these and their antecedents can be seen as the causes or sources of reading comprehension (see Figure 2). As shown in the Figure, vocabulary knowledge (Wagner et al., 2007) and prior knowledge are thought to be contributors to listening comprehension, though both and many other factors shown are also related to verbal intelligence. It is difficult to see how readers can understand a text if there are too many unknown words or concepts.

Over the last 25 years or so, we have learned a great deal about how the brain accomplishes the lower-level aspects of reading, especially decoding (e.g., Adams, 1990; Rayner et al., 2001). We know that a number of factors contribute to word reading, including phonological awareness (Stanovich, 2000), naming speed (Wolf & Bowers, 1999), orthographic knowledge (Levy et al., 2006), morphological awareness (Deacon & Kirby, 2004), and phonics knowledge (Adams, 1990).

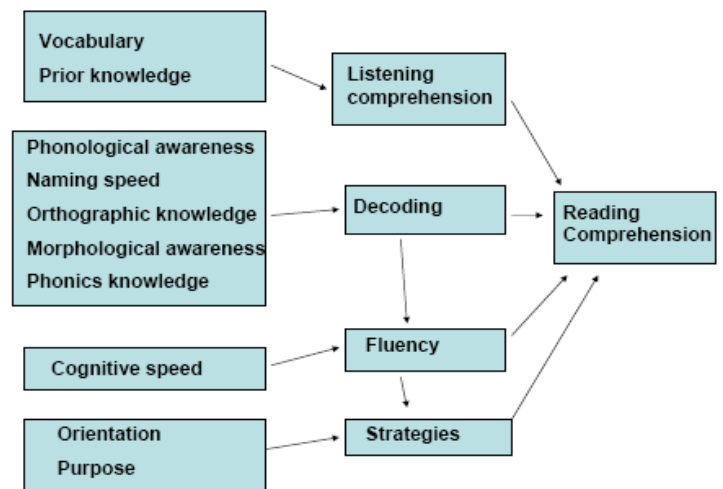


Figure 2. Causes/sources of reading comprehension.

Fluency is less well understood (Kuhn & Stahl, 2003), but clearly depends upon decoding efficiency, and cognitive and naming speed (Wolf & Bowers, 1999). As fluency drops, it becomes less and less likely that the needed information is still active in working memory, making comprehension less and less likely.

Reading comprehension strategies have been studied extensively (National Reading Panel, 2000, chapter 4). Dole et al. (1991) listed 5 major strategies, each of which is associated with greater reading comprehension: determining importance, summarizing information, drawing inferences, generating questions, and monitoring comprehension.

None of these factors has much influence in the absence of motivation and interest. Most children begin being interested in reading, but lose interest/motivation if their skills are not adequate or if the text content does not suit them.

3. Who is bad at it?

The factors listed in the previous section suggest the characteristics that will lead to poor reading comprehension. Children with low levels of skill in the various contributing factors will struggle with reading comprehension, children with more areas of low skill will struggle more, and the more they struggle the more their interest will suffer, creating a vicious circle. It is no secret that many children prefer other activities to reading, and that text content can turn a capable into an unenthusiastic reader very quickly (Pressley, 2002, chapter 8).

Two subgroups deserve mention. First, it should be no surprise that children with reading disabilities have difficulties in reading comprehension (Cornoldi & Oakhill, 1996), as these children's most obvious problem, word reading, is critical for reading comprehension. However it is important to recognize that some reading disabled children can develop adequate or even good levels of reading comprehension, especially if time constraints are not imposed (Lefly & Pennington, 1991). It is not yet clear how they do this, but it almost certainly involves a great deal of practice, re-reading, and strategy use.

Secondly, some authors refer to a group of children termed *poor comprehenders* (e.g., Nation, 2005). These children are described as having normal word level processing, but some language comprehension difficulties that interfere with reading comprehension. These language difficulties involve drawing inferences, understanding figurative language, and monitoring their

own comprehension. Most current approaches to reading disability will miss these children, who may need intensive language-oriented intervention.

4. How should we measure it?

A crucial component to understanding reading comprehension is its measurement. There exist many very different methods of measuring reading comprehension, including multiple choice questions after short passages, fill-in-the-blanks cloze tests, short-answer constructed response tests, and much longer constructed responses such as text retelling and summarizing. There is growing recognition that these different measures do not necessarily assess the same things. For example, multiple choice questions are efficient to score, but may not do a good job of assessing higher-level comprehension skills such as in situation model construction. Essay questions may seem more valid, but may allow children with more extensive prior knowledge to conceal their reading comprehension difficulties. Poor performance on constructed response questions may reflect writing more than reading problems. See Paris and Stahl (2005) for recent reviews of assessment issues.

It seems clear that what is needed is a broadly-based and comprehensive approach to assessment, one in which the types of task are tailored to the purpose of the assessment, and one in which initial, somewhat simplistic assessments are followed up with certain children with more extensive and intensive assessments. Assessments should make sense in terms of what we know about the cognitive processes involved, and should respect individual differences in interests, etc. Educationally, it is essential that at least some of the assessments be *instructionally sensitive*, i.e., that they are able to show the effects of instructional interventions, and that they yield applicable feedback to teachers and learners (see Sweet, 2005; RAND Reading Study Group, 2002).

Conclusion and implications

Reading comprehension is a complex process in itself, but it also depends upon other important and complex lower-level processes. It is a critical foundation skill for later academic learning, many employment skills, and life satisfaction. It is an important skill to target, but we should not forget about the skills on which it depends. To improve the reading comprehension skills of poor performers, we need to understand that there is no “magic wand” hidden in Figure 2, no secret weapon that will quickly improve reading matters for all poor readers. Careful assessment is required to determine individual children’s strengths and weaknesses, and programs tailored accordingly; most children will need continued support in many areas. The roots of many reading comprehension problems lie in the early elementary years; waiting to address them in high school is a high-risk strategy.

I suggest that the information reviewed here has implications for regular classroom instruction, special education, educational assessment, and teacher education.

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