Reading Comprehension: Its Nature and Development

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Reading Comprehension: Its Nature and Development

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Introduction and Key Research Questions

Reading comprehension is the process by which we understand the texts we read. It is the purpose of reading, why we teach it, and why we care about it. It is also the prerequisite for meaningful learning from text. As I discuss in this entry, reading comprehension is complex, and we are still far from a complete understanding of it. But we have learned a great deal. My purpose in this paper is to review recent research and theory around three basic questions: (1) What is reading comprehension?, (2) What factors contribute to the development of reading comprehension?, and (3) Who are the "poor comprehenders"? This entry sketches answers to these questions and provides links to sources in which they are treated in more depth. Reading comprehension does not develop in a vacuum, in isolation from other language and literacy processes, so this entry should be read in conjunction with the others in this section on reading comprehension, and with those in other sections.

Recent Evidence

1. What is reading comprehension?

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 accomplished in 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 the majority of humans did not do it (Olson, 1994). It should not be surprising that reading comprehension is difficult. The application of comprehension to text amplifies our mental capacities. It is fundamental to full participation in society, now and for the foreseeable future.

Levels of processing in reading

It is important to understand that reading occurs at several different levels, and how these levels interact. One way of describing those levels is presented in Figure 1 (see below). The lowest level shown there, *Words*, sits on top of many even lower levels of processing that are beyond the scope of this paper (see Kirby, 1988, and Kirby & Williams, 1991). Successful word recognition (either pronunciation, or, more rarely, recognition of meaning without being able to pronounce) is a prerequisite for the higher

levels of comprehension. If some words cannot be recognized, the higher levels can compensate to some extent (shown as "top-down processing" in Figure 1). Unknown words can be inferred in some cases; however, this is more difficult than it sounds, it can only work for some kinds of words and only for a small number of words in any text, and it is very processing intensive. Once words have been recognized, the question of word meaning arises (see the entry on vocabulary in this section of the Encyclopedia, Biemiller, 2007); it is possible to make sense of text when the meaning of some words is lacking or hazy, but beyond a modest level of uncertainty, comprehension becomes impossible.

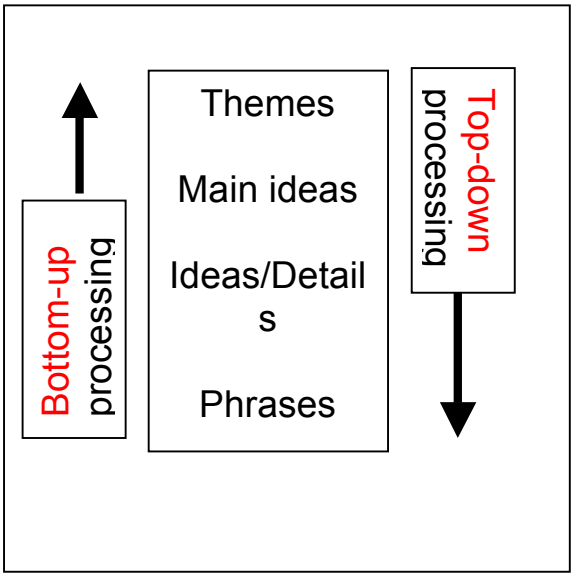

Figure 1. Levels of processing in reading comprehension.

Two types of processing occur: "bottom-up" and "top-down". In bottom-up processing, words are formed into phrases, and phrases are formed into more abstract units called propositions or ideas; these processes require knowledge of syntax (grammar). Just as several words can be processed into one phrase, several phrases can be processed into one idea. Comprehension at the phrase or idea level results in a relatively shallow understanding of what the text stated directly, often termed *literal* comprehension. Further processing of these ideas either selects particular ones as main ideas, or constructs main ideas from them, and then thematic generalizations or abstractions out of the main ideas. Top-down processing occurs when higher-level information, just as knowledge of the general topic of the text, helps the reader identify lower-level information. It is important to recognize that both bottom-up and top-down processing often occurs in reading comprehension. This is called *interactive* processing. The higher levels of processing require prior knowledge to help decide what is important, and especially to see the deeper implications of the text.

Processing occurs in these levels to make best use of working memory resources. Working memory contains information or thoughts that we are currently aware of; it is generally agreed that working memory is limited to four or five units and that there is no limit to the size of those units (e.g., Baddeley, 1986). Thus we might only be able to retain four or five unrelated words, but with coherent text we can process hundreds or

even thousands of words into a relatively small number of main ideas and even fewer themes. With those higher-level units retained, we can often reconstruct (through top-down processing) the important lower-level units. Efficient and automatic functioning of the lower levels in Figure 1 is a prerequisite for the higher levels. If too much conscious awareness has to be devoted to, for instance, sounding-out and recognizing words, it is difficult for thinking to reach much above the Phrase level. In this way the lower levels can act as bottlenecks.

The simple view of reading

Gough and Tunmer (1986) proposed the *simple view* of reading, in which reading comprehension is seen as the product of decoding and listening comprehension. Though simple, this approach does a remarkably good job of accounting for the data (e.g., Johnston & Kirby, 2006; Joshi & Aaron, 2000), and it reminds us that the ability to decode words is absolutely essential for skilled reading; those with *either* very low decoding skills or very low oral comprehension skills will be poor reading comprehenders. Decoding or word reading is often the bottleneck that prevents readers from attaining higher or adequate text comprehension (see Figure 1). However, listening comprehension, which represents verbal ability, is also essential. Verbal ability is a key component of intelligence, and may be very difficult to improve through instruction; it includes knowledge of vocabulary, grammar, the ability to make inferences, and so on. Decoding provides a more promising and fruitful target for instruction.

Two important factors beyond decoding and listening comprehension can be added: *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 it is needed for reading comprehension because of working memory limitations. If word recognition is slow, then previous words will have faded from working memory before later words are recognized, and their joint meaning will not be able to be processed. Strategies (e.g., Dole et al., 1991; National Reading Panel, 2000, chapter 4) are important in reading, and more useful than in listening, because the text stays present and allows re-inspections. Strategies are particularly useful when the text is long and/or complex, and the reader has many options about where to attend. We expect skilled readers to extract more from text than they would from speech, and some of that comes from 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 of processing (Kirby & Woodhouse, 1994).

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 the word *cat* to the concept *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. 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).

These pieces of information 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 are integrated into higher-level units; long-term memory stores some low-level information, but comprehension relies critically upon long-term memory's higher-level, more abstract or schematic information. The abstract information 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). It is equally important to remember that the processing of lower-level units does not guarantee the comprehension of higher level units.

2. What factors contribute to the development of reading comprehension?

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 Figure 2, vocabulary knowledge (Wagner et al., 2007) and prior knowledge contribute 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 many unknown words or concepts.

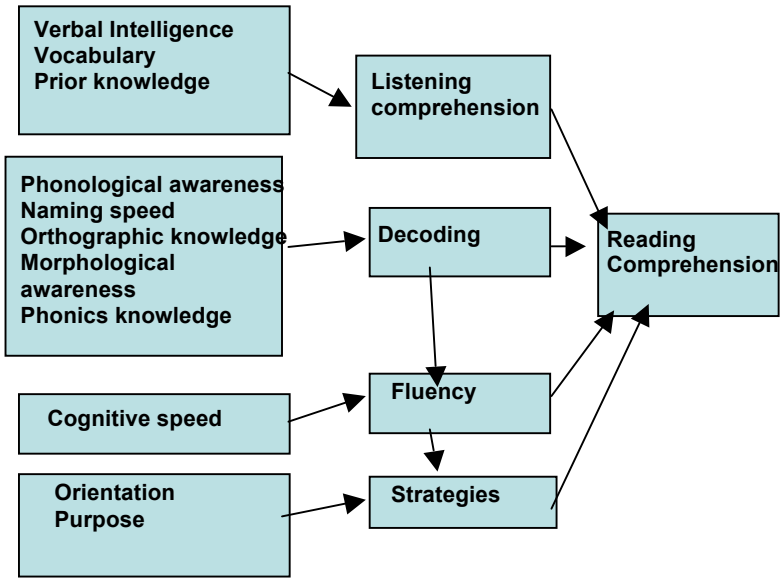

Figure 2. Sources of reading comprehension

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; Nunes & Bryant, 2006), and phonics knowledge (Adams, 1990).

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 are interested in reading when they begin school, but some can lose interest/motivation if their skills are not adequate or if the text content does not suit them.

3. Who are the "poor comprehenders"?

The factors listed in the previous section indicate the characteristics that will lead to poor reading comprehension. Children with lows 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 cycle. It is no secret that many children prefer other activities to reading, and that uninteresting text content can turn a capable reader into an unenthusiastic reader very quickly (Pressley, 2002, chapter 8).

Two subgroups of children who show poor reading comprehension deserve mention. First, it should be no surprise that children with reading disabilities have difficulties in reading comprehension (Cornoldi & Oakhill, 1996): these children's most obvious and primary problem is with word reading, which 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., Cain, Oakhill & Bryant, 2004; Nation, 2005). These children have normal word level processing, but also have 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 assessment approaches to reading disability will overlook these children who may need intensive language-oriented intervention. Some of these children may have

low general ability, hence, it may not be surprising that they have low reading comprehension. However, this is no excuse not to teach them. Other children, though this is not yet clear, may have relatively specific difficulties in comprehension processes, difficulties that targeted instruction may help to overcome; this remains a question for future research.

Future Directions

There is continuing need for research that explores the factors shown in Figure 2, their inter-relationships, and how they affect reading at both the word and comprehension levels. Some relatively new factors, such as naming speed and morphology, may allow us to better understand reading comprehension and its failures.

One of the challenges in this area concerns the ways in which reading comprehension is measured (see Paris, 2007, this section). Formal, standardised tests are very expensive to develop, and often fail to include the highest levels of reading comprehension (those related to the thematic or situation model level). Reading comprehension measures are also often given without word reading measures, making it difficult to diagnose the source of any observed problems. There is need for continuing development of theory-based tests and testing policies. All of this work points towards instructional research that explores how best to combine the factors shown in Figure 2 to design effective classroom and remedial instruction (see Phillips, 2007, this section).

Conclusions

Reading comprehension is a complex process in itself, but it also depends upon other important lower-level processes. It is a critical foundation 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, and no secret weapon that will quickly improve reading competencies for all poor readers. Careful assessment is required to determine individual children’s strengths and weaknesses, and programs need to be tailored accordingly; most poor readers will need continued support in many areas. The roots of most reading comprehension problems lie in the early elementary years. Waiting to address them in later elementary or even secondary school is a high-risk strategy.

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