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Impact of question-answering tasks on search processes and reading comprehension

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Abstract

This study examined the effect of (a) high- and low-level questions and (b) reading the text before the questions asked on performance, delayed text recall, and deep text comprehension, as well as on specific text-inspection patterns. Participants were 37 undergraduate students who answered either high- or low-level questions using the software Read&Answer to read and answer questions on the computer screen. Additionally, half of the sample read first a text and then answered the questions (reading-first condition), whereas the other half answered the questions without having read the text in advance (no-reading-first condition). All participants had the text available to search for the answer. Results indicated that high-level questions facilitated deep comprehension but not immediate performance or delayed recall of text, independently of the reading condition, and that high- and low-level questions differentially affected text-inspection patterns.

Keywords: Question answering; Online processing measures; Text recall; Deep comprehension

1. Introduction

Reading complex documents in order to answer questions is a common learning situation that modifies the reading processes as described by general comprehension models (Graesser, Singer, & Trabasso, 1994; Kintsch, 1998). When reading to answer questions, the reader needs to be able to discriminate between relevant (i.e., information needed to answer the question) and irrelevant information, given the possibility of reading the latter information more superficially. Moreover, reading may not be linear, that is, reading first the text and then answering the questions on it, but directed by information-search processes which lead the reader to navigate across the text. Understanding how students process textual information in such reading situations is one of the aims of research in reading comprehension. There is research evidence suggesting that questions deeply influence the processing of instructional materials (André, 1979; Hamilton, 1985). Research on question-answering behaviour has traditionally distinguished

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between general or high-level questions and specific or low-level questions (André, 1979; Hamilton, 1985; Rickards, 1979). However, the evidence from extant studies on high- and low-level questions is contradictory and inconclusive.

Specifically, although several studies have found that high-level questions are more beneficial than low-level questions (André, 1979; Hamilton, 1985; Vidal-Abarca, Mengual, Sanjose, & Rouet, 1996; Wixson, 1983), other studies have not found significant differences (Rouet, Vidal-Abarca, Bert-Erboul, & Millogo, 2001). Moreover, except for a few studies (Vidal-Abarca et al., 1996), the effectiveness of high- and low-level questions has not been assessed using measures that capture more superficial versus deep comprehension levels, making generalisations impossible. Second, in most studies, high-level questions usually cover more textual information than low-level questions. Therefore, the beneficial effect of high-level questions may be due to the amount of text information covered by these questions, rather than to the specific nature of mental processes induced by them. Third, materials used in question-answering studies are very diverse, ranging from one single paragraph (Wixson, 1983) to documents with several pages (Rouet et al., 2001), which makes it difficult to compare. Finally, very few studies have allowed students to re-read the texts while composing their answers and only Rouet et al. (2001) have registered question-answering online processes. Analysing online processes in detail could shed light on students' mental processes when answering different kinds of questions.

1.1. High- vs. low-level questions and learning from text

There is ample research on the use of different types of questions in text comprehension and learning tasks (Cerdán et al., in press; Goldman & Durán, 1988; Graesser & Franklin, 1990; Graesser, Lang, & Roberts, 1991; Trabasso, van den Broek, & Lui, 1988; Wixson, 1983). Specifically, Goldman and Durán (1988) identified five types of questions that varied in terms of their relation to the text and the types of processing activities required to answer them. In general, Type 1, 2, and 3 questions shared a verbatim relationship with the text but varied in the kind of text processing activities needed for answering; Type 4 questions required integration across segments, and Type 5 questions required reasoning beyond the text. According to the Quest model (Graesser & Franklin, 1990), complex questions, like high-level ones, focus on broad conceptual structures. In contrast, simple questions (i.e., low-level) focus on single concepts or propositions.

In this article we define high-level questions as those in which the answer is not explicitly stated in the text but requires integration across several distant paragraphs. They are equivalent to Goldman and Durán's (1988) Type 4 questions. Low-level questions are those in which the answer can be located in specific segments of the text and can be extracted by copying or by making minimal inferences across close sentences. In these questions, therefore, there is always a verbatim relationship between the question and the text, as in Goldman and Durán's (1988) Type 1, 2, and 3 questions. Consequently, the principal distinction between high- and low-level questions is the location of the answer (dispersed vs. concentrated) and the need or not for integration across segments (e.g., by summarizing, comparing, and contrasting).

Many experimental studies have found beneficial effects of high-level questions on several learning measures, such as text recall and deep comprehension (Vidal-Abarca, Gilabert, & Rouet, 1998; Vidal-Abarca et al., 1996). However, Rouet et al. (2001) did not find significant differences in a summary task between students who had answered high-level and low-level questions. The nature of the assessment task may explain the contradiction. Vidal-Abarca et al. (1996, 1998) used two kinds of learning measures, namely recall of text ideas and inference drawing. Interestingly, no significant differences were found for text recall (as with the summary task of Rouet et al., 2001), although a beneficial effect for high-level questions was found in inference drawing. Therefore, benefits from high-level questions may appear only when the reader is asked to perform cognitively demanding tasks, such as deep comprehension that requires inference drawing.

At this point, an important distinction should be made between task performance and learning. Schmidt and Bjork (1992) presented evidence showing that experimental conditions that facilitate performance during learning can be detrimental in the long term and, conversely, manipulations that increase processing difficulty can nevertheless support the long-term goals of learning. Thus, making the process of learning more effortful may be helpful in terms of learning. In a similar vein, Wiley and Voss (1999) found that providing students with information in a multiple source format instead of a simpler book chapter format, and instructing them to write arguments instead of simpler tasks (e.g., narratives or summaries), produced more integrated and causally connected essays, whereas no impact was apparent at the level of superficial understanding (i.e., performance on sentence verification tasks). Cerdán